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Child Behavior, Animal Behavior, and Comparative Psychology

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EDITED BY

Carl Murchison

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MARCH, 1947

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(OVER)

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The Journal of Genetic Psychology, 1947, 70, 3-28.

AN ANALYSIS OF CHILDREN'S ATTITUDES TOWARD FATHERS*

Graduate School of Education, Cornell University

L. PEARL GARDNER

A. THE PROBLEM

In a former paper (1) a study was made of the attitudes and activities of fathers from the standpoint of fathers. This paper presents a continuation of the study of paternal attitudes from the standpoint of children. Data is given on the children's negative and positive criticisms of the father, interchange of affection, paternal attributes as adopted goals, a survey of various factors affecting the parent-child relationship, such as recreation, services rendered, punishment, teasing, favoritism, and home duties, and the effects of sex upon the father-child relationship. On most of these topics some comparison between the father and mother was possible.

B. TECHNIQUE OF RESEARCH

A questionnaire of 45 questions (Table *A*) necessitating a minimum of writing was presented to the fifth and sixth grades of the city of Ithaca, New York, during the school day near to Father's Day. The general instructions given at the beginning were as follows:

> We have been able to find out from fathers a great many things that they think about their children. This has helped a great deal in letting children know what they can do to please their fathers. But we do not know much about what children think about their fathers and fathers do not always know what they should do to please their children. To find out some of these things we are asking you to tell us how you feel about your father. You can tell us these things by marking these sheets of paper as I shall direct you. There will be no names on the paper and you can say exactly what you think.

Each question was specifically explained as the children marked their answers during the half hour usually needed for the task.

---

*Received in the Editorial Office on December 24, 1945.

TABLE *A*

Sex ——— Age ——— Grade ——— No. children in family ———

Position in family: only child oldest youngest only girl or boy

1. Which of the following things does your father do that you wish he would not do. *Underline* these.

not swear
not drink
not grumble
not scold
not tease
not shout
not whistle
not complain
not spit
not be cross

not smoke cigar
not bang things
not forget to shave
not chew tobacco
not smoke pipe
not dress shabbily
not loose his temper
not eat noisily
not be sulky, silent
not be so dirty

not read newspaper so much
not repeat stories and jokes
not speak foreign language
not come home late at night
not use poor English
not talk so much
not quarrel with mother
not rub whiskers on you
not be old fashioned
not be away from home so much

Other things you wish he would not do ———

2. What do you do with your father that is most fun for you? ———
3. How often does your father play with you? just weekends every day a little just once in a while not very often
4. Do you think your father is too busy to play with you? Yes No
5. Do you think your father likes to play with you? Yes No
6. Does your father play with your brother more than you? Yes No
7. Does your father play with your sister more than you? Yes No
8. List all the games or ways your father plays with you ———
9. Do you wish your father would play more often with you? Yes No
10. What chores or duties does your mother ask you to do? ———
11. If you tease can you get out of her chores? often occasionally
12. What chores or duties does your father ask you to do? ———
13. If you tease can you get out of his chores? often occasionally
14. Who asks you to do more chores for them? father mother
15. If you had little time whose chores would you omit? father's mother's
16. Whom do you like to help better? father mother both
17. Does your father like your brother more than you? Yes No
18. Does your father like your sister more than you? Yes No
19. Does your father like you best of all the children? Yes No
20. Do you wish your father showed more love toward you? Yes No
21. When you grow up in what ways do you want to be like your father?
22. In what ways will you want to be different from him when you grow up?
23. What is your father's nickname for you? ——— Do you like it? ———
24. How does your father tease you? ———

    Do you like to have him tease you? ———
25. How does your father make you afraid? ———
26. Does your mother like your brother more than you? Yes No

TABLE *A* (*continued*)

27. Does your mother like your sister more than you? Yes No
28. Does your mother like you best of all the children? Yes No
29. Do you wish your mother showed more love toward you? Yes No
30. When you grow up, in what ways do you want to be like your mother?
31. In what ways will you want to be different from her when you grow up?
32. To whom would you go for help in the following situations:
    - If I cut my finger, I'd go to mother father
    - If I needed money, I'd go to father mother
    - If I had a hard lesson, I'd go to mother father
    - If I had a headache, I'd go to father mother
    - If I had a broken toy, I'd go to mother father
    - If I had trouble in school, I'd tell father mother
    - If I want to go to a show, I'd ask mother father
    - If I want to buy something, I'd ask father mother
    - If someone made me cry (hurt my feelings), I'd tell mother father
    - If I lost my book or sweater, I'd tell father mother
    - If I had a bad dream, I'd call to father mother
33. Do you like father just a little better than mother? Yes No
34. Who understands you better? father mother same
35. Who is better natured, easier to get along with? father mother same
36. Who would you rather went away on a visit? father mother
37. Who is the bigger boss at your house? father mother
38. Do you like mother a little better than father? Yes No
39. Underline the following things you wish your father would do:
    - talk more with me
    - give me more clothes
    - give me an allowance
    - punish me less
    - put his arm around me
    - scold me less often
    - let me go to shows more
    - show more affection to me
    - hit me less often
    - give me more money
    - give me more gifts
    - give me better food
    - give me less chores
    - give me more attention
    - let me play more

    Other things I wish father would do for me ——————
40. When you have to be punished for doing something wrong who will usually punish you? father mother both
41. Who would you rather have punish you? father mother
42. How does your father usually punish you? ——————
43. How does your mother usually punish you? ——————
44. Should your father punish you? more often less often same as now
45. Should your mother punish you? more often less often same as now
46. Who is easier with you when you're naughty? mother father same

C. STATUS OF SUBJECTS

Questionnaires were obtained from 388 children for which Table 1 gives details of age, grade placement, and sex. In the group 25 per cent were 10 years old, 44 per cent were 11, and 23 per cent were 12. There were 44 per cent in the fifth grade and 56 per cent in the sixth. Of the entire group 47 per cent were male and 53 per cent female with the sexes about equally represented in each grade. Concerning the number of children in the families, 16 per cent had one child, 27 per cent two children, 18 per cent three, 13 per cent four, and 11 per cent five. Thus 61 per cent came from families of three or less. In the families of only children, girls were more numerous, otherwise the sexes were about equally divided. There were 27 per cent oldest and 27 per cent youngest children in the group.

TABLE 1
DISTRIBUTION OF CHILDREN ACCORDING TO AGE, GRADE, AND SEX

CA	Grade V M	Grade V F	Grade V T	%T	Grade VI M	Grade VI F	Grade VI T	%T	Totals M	Totals F	Totals T	%T
9	—	1	1	.2	—	—	—	—	—	1	1	.2
10	33	56	89	22.9	4	5	9	2.3	37	61	98	25.2
11	36	29	65	16.7	36	68	104	26.8	72	97	169	43.8
12	8	5	13	3.3	42	34	76	19.5	50	39	89	22.9
13	2	—	2	.5	14	8	22	5.7	16	8	24	6.2
14	1	—	1	.2	5	—	5	1.3	6	—	6	1.5
15	—	—	—	—	1	—	1	.2	1	—	1	.2
Tot.	80	91	171		102	115	217		182	206	388	
%T	20.6	23.4	44.1		26.2	29.6	55.9		46.9	53.1		

D. REPORT OF RESULTS

1. *Sensitivity to Father-Child Relationship*

An effort was made to estimate the children's satisfaction with the father-child relationship through a list of 30 acts (Item 1 in the questionnaire) which the child might wish the father would not do. As Table 2 shows, the most frequent sources of dissatisfaction were: scolding, general irritability, poor adjustment with the mother, and absence from home. When whistling annoyed the child, there were usually more than 10 items checked and this annoyed girls twice as often as boys.

Only 11 per cent (8 per cent boys, 14 per cent girls) added other items to this list. These children were evenly distributed among the grades and were more often girls than boys. Most common additional criticisms of the father were for his spanking, work required of the children, his sleeping too much, and his favoritism.

Sex influenced selection of criticisms somewhat less than grade and age. The average number of criticisms for all children was 5.8 (6.3 boys, 5.4 girls). In the whole group 40 per cent (35 per cent boys, 44 per cent girls) checked five or less items, 64 per cent (55 per cent boys, 70 per cent girls) checked 10 or less items, and 20 per cent (28 per cent boys, 10 per cent girls) checked 11 or more items. More boys than girls checked 22 of the items with

TABLE 2
THE PERCENTAGE OF CASES CHECKING ITEMS ON THE NEGATIVE LIST OF PATERNAL CRITICISMS FOR THE GRADES, SEXES AND TOTAL GROUP

	Grade		Sex		
	V	VI	M	F	Total
1. Scold	50	35	43	40	42
2. Lose his temper	44	33	37	38	38
3. Be cross	43	29	35	35	35
4. Quarrel with mother	40	26	36	29	32
5. Swear	38	26	30	33	31
6. Be away from home so much	33	21	31	22	26
7. Complain	27	21	26	22	24
8. Come home late at night	32	16	26	19	23
9. Grumble	28	19	25	21	23
10. Tease	27	20	20	26	23
11. Drink	28	15	24	18	21
12. Forget to shave	27	16	23	20	21
13. Read newspaper so much	20	19	18	23	21
14. Shout	26	12	24	14	19
15. Smoke cigar	25	13	21	16	18
16. Rub whiskers on you	21	15	17	18	18
17. Bang things	25	9	19	14	16
18. Spit	23	12	19	15	16
19. Use poor English	20	12	17	14	15
20. Be old fashioned	16	12	16	12	14
21. Dress shabbily	19	9	15	12	13
22. Smoke pipe	15	11	15	11	13
23. Be sulky silent	14	12	16	10	13
24. Speak foreign language	14	10	13	11	12
25. Eat noisily	16	10	15	10	12
26. Chew tobacco	16	10	14	11	12
27. Talk so much	13	7	11	9	10
28. Repeat stories and jokes	11	9	12	7	10
29. Be so dirty	12	5	10	6	8
30. Whistle	4	2	2	3	3

the greatest difference, a difference of 10 or less, for shouting, being away from home, quarreling with the mother, getting home late, grumbling, and sulking. Six per cent more girls than boys checked teasing and 5 per cent more checked reading the newspaper. For the most part both sexes disliked the same things in the father but boys were either more critical or more frank than girls.

The difference between the fifth grade (21 per cent boys, 23 per cent girls) with an average of 7.3 items checked and the sixth grade (26 per cent boys, 30 per cent girls) with an average of 4.6 was probably essentially due to age. Five or less items were checked by 36 per cent of the fifth grade and 45 per cent of the sixth grade; 10 or less items by 60 per cent of the fifth grade and 69 per cent of the sixth grade. There were 16 per cent more in the fifth grade than in the sixth who checked getting home late and banging things; 15 per cent more who checked scolding, 14 per cent more checked quarreling with mother, being cross and shouting; 13 per cent more checked drinking and 12 per cent more checked swearing, smoking cigars, and being away from home. Perhaps the children of the sixth grade were more patient and understanding than the fifth grade, perhaps they were more indifferent because of interest in other things, or perhaps they had learned to keep silent. From some standpoints a grade difference would be largely an age difference. The 10-year-olds (38 per cent boys, 62 per cent girls) had an average of 7.1 items, 11-year-olds (43 per cent boys, 57 per cent girls) had 5.8, 12-year-olds (56 per cent boys, 44 per cent girls) had 4.5, and 13- to 15-year-olds (74 per cent boys, 26 per cent girls) had 5.8. At each age the children tended to be sensitive to similar items but they varied somewhat in the amount of sensitivity or frankness.

Other factors, such as position in the family, size of the family, and economic status varied in their effects upon the number of criticisms. Position in the family had slight effect since only children had an average of 5.2 criticisms, youngest children 5.9, and oldest children 5.5. In families of six or more children, the average number of criticisms was 5.3. These were practically the same as the 5.3 for the group as a whole. It seemed quite possible that the tobacco chewing fathers might represent a lower economic group than the cigar smoking fathers. The average number of criticisms of the children who checked cigar smoking as one item was 7.6 and of those who checked tobacco chewing was 12.8.

Another check on the satisfactory adjustment of the father-child relationship was made by a list of 15 acts (Item 39) a child might wish the father would do. As Table 3 shows, money, freedom for play and entertainment, companionship with the father and decrease of punishment were desired most frequently. Next to the lowest item was a desire for the father to show affection by putting his arm about the child. The lowest item was a desire for better food, checked by 7 girls and 11 boys, with two-thirds of the cases checking this under 12 years of age.

Additional items were given by 24 per cent boys and 27 per cent girls to the positive list. Requests for specific forms of attention (59 per cent boys, 54 per cent girls), for more freedom (11 per cent boys, 30 per cent

TABLE 3
THE PERCENTAGE OF CASES CHECKING ITEMS ON THE POSITIVE LIST OF PATERNAL CRITICISMS FOR THE GRADES, SEXES AND TOTAL GROUP

	Grade		Sex		
	V	VI	M	F	Total
1. Give me an allowance	41	35	35	39	37
2. Give me more money	40	33	37	35	36
3. Let me play more	39	31	38	31	35
4. Let me go to shows more	40	32	39	32	35
5. Talk more with me	36	28	35	28	31
6. Punish me less	35	27	35	26	30
7. Scold me less often	32	25	31	25	28
8. Give me more gifts	27	20	26	21	23
9. Give me more attention	25	20	24	21	22
10. Give me less chores	23	17	26	15	20
11. Show more affection to me	25	15	20	19	19
12. Give me more clothes	20	16	13	22	18
13. Hit me less often	25	13	22	15	18
14. Put his arm around me	20	9	14	13	14
15. Give me better food	9	2	8	3	5

girls), and for gifts (30 per cent boys, 16 per cent girls) were most often given.

Results on the whole, were less affected by sex than by grade and age. The average of number of positive items selected by all cases was 3.7 (boys 4.0, girls 3.5). In the total group 49 per cent (46 per cent boys, 50 per cent girls) checked five or less items, 75 per cent (76 per cent boys, 72 per cent girls) checked 10 or less, and 25 per cent failed to check any item. On 13 of the 15 items, the per cent of boys checking was greater than for girls. There were 11 per cent more boys who checked "give me less chores," 9 per cent more checked "punish me less"; while 9 per cent more girls wanted more clothes. The first five items most often selected were the same for both sexes with but slight difference in order. The two sexes had practically identical choice on the items: "show more affection to me," and "put his arm around me." The fifth grade checked an average of 4.4 items and the sixth grade 3.2. Five or less items were checked by 49 per cent of the fifth grade and 50 per cent of the sixth grade. Ten or less were checked by 79 per cent of the fifth grade and 72 per cent of the sixth grade. The per cent of cases selecting all items was greater for the fifth grade than the sixth grade with the greatest difference on the three items: "hit me less," "put his arm around me," and "show me more affection." The 10-year-olds checked 4.1

items, the 11-year-olds 3.8, the 12-year-olds 2.8, and the 13- to 15-year-olds 4.8 items.

Position in the family did not affect the number of items selected on the positive list since only children had 3.5, youngest children 3.9, oldest children 3.5, and children in families of 6 or more 3.8 items. For the children on the negative list who checked smoking cigars, the average on the positive list was 4.4 and for those selecting tobacco chewing, 5.6. Thus the trend for these last two items which might indicate economic status was the same for both lists but not so large for the positive list.

Results of the negative and positive criticisms, as indicators of children's sensitivity to the father-child relationship, were consistent for the most part. Differences on the positive list were in the same direction as those on the negative list but were not so great. On both lists the sexes were sensitive to similar criticisms but boys tended to be more critical than girls either because of greater sensitivity or frankness. The fifth grade checked more items than the sixth grade on both lists, indicating more sensitivity, less understanding, less distracting interests, or more frankness. On both lists criticisms decreased from the tenth through the twelfth year and then increased through the thirteenth to fifteenth year. Position in the family did not affect the number of items selected in either list but economic factors may have affected this. The items that children were most sensitive to on both lists in the father-child relationship were: punishment, irritable disposition of the father, poor relationship with the mother, spending money, freedom for play and recreation, and attention from the father. Neither sex desired to any extent additional affection from the father.

2. *Paternal and Filial Affection*

There were 15 per cent (13 per cent boys, 17 per cent girls) of all the group (excluding only children) who thought the father liked them "best of all the children" (Item 19). Of the 50 children who felt the father liked them best, 38 per cent also thought the mother did likewise with this somewhat more frequent among girls than boys. Repetition of this question (Item 28) relative to the mother indicated that 17 per cent (15 per cent boys, 18 per cent girls) of the group felt she liked them best. Of these 54 children, 33 per cent felt the father also liked them best, again more frequent in the case of girls than boys.

Only 14 per cent (15 per cent boys, 13 per cent girls) liked the father a little better than the mother (Item 33), while 67 per cent (64 per cent boys, 72 per cent girls) did not. The question was omitted by 19 per cent

(24 per cent boys, 15 per cent girls). The fifth grade (16 per cent) and sixth grade (13 per cent) gave similar affirmative answers. The mother was liked better than the father (Item 38) by 32 per cent (34 per cent boys, 32 per cent girls), while 46 per cent (40 per cent boys, 50 per cent girls) answered negatively. The question was omitted by 22 per cent (26 per cent boys, 18 per cent girls). No grade differences were noted. Preference for the mother was more than double that for the father (*CR* 6.1) without sex difference except that boys preferred to omit the question rather than answer negatively.

Did the children who felt a parent preferred them, in return prefer that parent? Of the children who thought the father liked them best, only 16 per cent liked the father better than the mother. Of these there were 43 per cent boys and 65 per cent girls who did not. Of the children who felt the mother liked them best, 46 per cent liked her better than the father. Of this latter group 14 per cent boys and 39 per cent girls did not like her better.

Two questions concerning the children's desire for more parental affection did not indicate any preference for the parent of like or unlike sex. There were 40 per cent (37 per cent boys, 43 per cent girls) who wished the father to show more love toward them (Item 20), and 35 per cent (33 per cent boys, 36 per cent girls) who wished the mother to show more love (Item 29). Both grades gave affirmative answers in 40 per cent of cases relative to the father. For the mother 37 per cent of the fifth grade and 32 per cent of the sixth grade answered affirmatively.

One child in six felt, or perhaps admitted, parental preference. Such preference was equally frequent for both parents. About one child in seven liked the father better than the mother while one in three liked the mother better. It was noteworthy that both boys and girls gave almost identical positive answers to these questions concerning child-parent affection.

Several items concerning the parents gave some bases for the strong maternal preference. Only 9 per cent of the group thought the father understood them better (Item 34), 35 per cent thought the mother did, and 52 per cent were impartial. Only 13 per cent thought the father was "better natured and easier to get along with" (Item 35), 34 per cent thought the mother was, and 47 per cent were impartial. No age or sex differences were indicated in the answers. Of the children who liked the father better than the mother 45 per cent (63 per cent boys, 32 per cent girls) felt he understood them better, and 45 per cent (50 per cent boys, 41 per cent girls) felt he was better natured than she. Of those who liked the mother better than the father, 68 per cent (64 per cent boys, 71 per cent girls) felt she understood them better, and 68 per cent (same for both sexes) felt she was better natured. There was a tendency for greater understanding between the child and parent of the same sex, somewhat more pronounced in the case of the father. There were 35 per cent who would prefer the father to go away on a visit, 34 per cent the mother, and 31 per cent omitted the item (36). For the "bigger boss at your house" (Item 7), 58 per cent selected the father, 25 per cent the mother with no age or sex differences shown. The preference for the mother was based to some extent at least, upon her greater understanding, a better nature, and less "bossing."

3. *Paternal Attributes as Adopted Goals*

There were 413 attributes of the father (Item 21) mentioned by 77 per cent (boys 74 per cent, girls 80 per cent) of the group. Boys gave an average of 1.1 ways they would like to resemble the father while girls gave 1.6. The occupation of the father was the most popular item (32 per cent) with these boys. Girls desired some occupational skill (13 per cent) of the father, such as driving or repairing the car. For the girls the good disposition of the father and his character traits were highest and each rated 30 per cent of their selections. Both sexes gave similar emphasis to the father's ability to work hard and his fun-loving nature. Both also desired the same paternal physical traits of strength and tallness.

The 401 attributes of the mother (Item 30) were mentioned by 75 per cent of the group (boys 62 per cent, girls 87 per cent). The boys gave an average of 1.1 attributes and the girls, 1.5. The good disposition of the mother was selected by the boys for 50 per cent of their attributes and by the girls for 41 per cent. Both sexes rated strong and healthy as the most important physical trait. The girls ranked the mother's occupation as their second highest attribute but the boys had little use for this. Boys desired to be like the mother "in all ways" very nearly as frequently as like the father while the girls used this phrase more than twice as frequently for the mother.

Children were less able to state ways they wanted to be different from the father (Item 22); only 281 attributes were given by 55 per cent of the children (boys 55 per cent, girls 57 per cent). Boys gave an average of 1.1 and girls, 1.5 attributes. Both sexes were most critical of the father's personal habits of smoking, drinking, and swearing; boys were more critical than girls. Second in importance for both sexes was the bad temper or "cross-

TABLE 4

THE PERCENTAGE OF CASES EXPRESSING APPROVAL AND DISAPPROVAL OF PARENTAL ATTRIBUTES

Attribute	Like father			Like mother			Unlike father			Unlike mother		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
Disposition	17	30	25	50	41	43	19	25	23	14	28	22
Physical appearance	17	16	16	12	13	13	13	14	14	22	22	22
Character traits	16	30	25	19	13	15	6	15	11	4	15	10
Occupation	32	13	20	3	20	15	2	4	4	41	9	23
Personal habits	3	3	3	0	1	1	50	34	40	5	4	5
Miscellaneous	3	5	4	6	5	5	7	6	6	9	22	16
"In all ways"	12	3	7	10	7	8	3	2	2	5	0	2

ness" of the father with the girls more than twice as critical from this standpoint.

The negative criticism of the mother (Item 31) was still less than the father's, only 31 per cent (35 per cent boys, 28 per cent girls) contributed 128 criticisms. Boys gave an average of 1.0 and girls, 1.2. The girls criticized the mother's bad temper, scolding, and crossness twice as often as boys did. Both were equally critical of her physical appearance with this item noticeably higher than in the case of the father. The strongest criticism of the mother (40 per cent) was the boys' dislike of her occupation with which was grouped the frequent wish "not to be a woman." No girl expressed a desire "not to be a man."

In summary it may be noted that children thought in positive imitative terms with regard to parents rather than negative. Girls gave more attributes than boys for both parents. Both boys and girls gave more positive attributes for the parent of the same sex than for the other one with some emphasis upon the occupational rôle of this parent. Both sexes rank disposition and character traits rather highly; the mother clearly leads in the former and possibly the father on the latter. On these two attributes there was a tendency for each sex to favor the parent of opposite sex. The negative criticism of the father's personal habits came chiefly from boys. Both sexes were more critical of maternal than paternal appearance. Boys expressed a certain disdain of woman's work and rôle not found in the girls' criticisms of the opposite sex.

4. *Factors Affecting Children's Attitudes*

a. Recreation. Several factors that affected the attitude of children toward the father were explored by the questionnaire. There were 372 (boys 159, girls 213) recreational activities (Item 2) mentioned by 80 per cent (boys 76 per cent, girls 83 per cent) of the group. Of these, outdoor games made up 43 per cent (boys 51 per cent, girls 37 per cent). For all children car riding, rough and tumble play, reading or talking each made up 11 per cent (boys 7-8 per cent, girls 13-14 per cent) of the activities. For the group, movies and church together made 7 per cent and indoor games 5 per cent of the activities.

Concerning the frequency of play (Item 3), 39 per cent of the children stated the father played with them every day, 29 per cent once in a while, 5 per cent week-ends, 17 per cent not often, and 10 per cent omitted the question. Fathers seemed to play slightly more often each day with girls (boys 33 per cent, girls 43 per cent) and the older children (fifth grade

33 per cent, sixth grade 43 per cent). In 52 per cent of the cases children thought he was too busy to play with them (Item 4), while 40 per cent did not think so. Boys were less lenient than girls (boys 33 per cent, girls 46 per cent) in excusing the father in this respect. Of all the children 81 per cent (Item 5) thought he liked to play with them (75 per cent boys, 86 per cent girls); this question was omitted by 15 per cent boys and 4 per cent girls. Some of the data suggest fathers preferred recreation with the girls to some degree.

b. Services requested of parents. To measure the frequency with which a child went to the father for help, a group of common services (Item 32) was presented with a choice of parent for each. Some children underline both parents. From Table 5 it will be observed that in all situations combined, the father was selected 28 per cent of times and the mother in 60 per cent. This preference for the mother's service was practically unaffected by age and very slightly, if at all, by sex. In some situations, such as having a bad dream, hurt feelings, trouble in school or a lost possession, girls seemed to seek the mother more often. However, this apparent difference was due in part to the fact that boys gave fewer responses to this question.

For the group as a whole there was a clear preference for the father in only two situations; namely, a broken toy 70 per cent, and a need for money 58 per cent. In the two situations of a hard lesson and a desire to buy something, the father was named by 32 per cent, the mother about twice as often. The mother was most popular for the following situations: a headache 87 per cent, cut finger 83 per cent, lost something 78 per cent, trouble in school 67 per cent, hurt feelings 64 per cent, and bad dream 64 per cent. In each of these situations the mother had three or more times the popularity of the father.

It may be observed that 75 per cent of the cases took four or less of these 11 situations to the father while 40 per cent took two or less. Analysis was made of the 11 cases who preferred the father in eight or more situations; with one exception these were all boys. Of these eight liked the father better than the mother, six thought the father was better natured, and seven thought he understood them better. Although some thought the parents alike in these qualities, only one thought the mother was better natured and understood him better. A similar analysis was made of the 86 cases (62 per cent girls, 38 per cent boys) who went to the father for help in one or less situations. In this group 83 per cent did not like the father better, 57 per cent liked the mother better, 62 per cent thought she was better natured, and 65 per cent thought she understood them better. In

TABLE 5

THE PERCENTAGE OF CASES UTILIZING PARENTAL SERVICE IN DIFFERENT SITUATIONS

Situation	Boys *F**	Boys *M*	Boys *B*	Boys *O*	Girls *F*	Girls *M*	Girls *B*	Girls *O*	V Grade *F*	V Grade *M*	V Grade *B*	V Grade *O*	VI Grade *F*	VI Grade *M*	VI Grade *B*	VI Grade *O*	Total *F*	Total *M*	Total *B*	Total *O*
1. Cut my finger	14	80	3	9	10	85	2	3	15	82	3	0	9	83	2	6	12	83	2	3
2. Needed money	58	29	7	6	58	34	4	4	59	32	6	3	57	31	5	7	58	32	5	5
3. Had a hard lesson	30	58	3	9	32	57	6	5	32	61	3	4	31	54	6	9	32	57	4	7
4. Had a headache	8	82	2	8	4	90	1	5	8	87	2	3	3	87	1	9	6	87	1	6
5. Had a broken toy	71	14	1	14	69	24	2	5	69	24	1	6	72	15	2	11	70	19	2	9
6. Had trouble in school	22	60	9	9	17	73	5	5	25	64	6	5	15	69	7	9	19	67	7	7
7. Want to go to a show	33	50	10	7	23	68	3	6	27	62	8	3	28	57	5	10	28	59	6	7
8. Want to buy something	36	49	6	9	29	60	4	7	35	56	4	5	30	54	5	11	32	55	5	8
9. Someone made me cry (hurt my feelings)	24	50	3	23	11	76	4	9	21	63	3	13	14	65	4	17	17	64	4	15
10. I'd lost my book	18	68	5	9	8	86	2	4	15	79	4	2	10	76	4	10	12	78	4	6
11. Had a bad dream	25	56	2	17	16	71	4	9	24	65	3	8	17	64	2	17	20	64	3	13
All combined	31	54	5	10	25	66	3	6	30	61	4	5	26	60	4	10	28	60	4	8

F—Father. *B*—Both.
M—Mother. *O*—Omitted.

the cases where an extreme preference for either parent was expressed for services, it was the parent of like-sex, the better natured, and the better liked of the two. Such factors as the number of criticisms given the father, the parent punishing, and the amount of recreation with the father seemed unrelated as far as the data revealed.

c. Punishment. Punishment (Item 40) was usually given by the father in 29 per cent cases, by the mother in 30 per cent, and by both in 33 per cent. Both grades gave very nearly the same percentages as the entire group. One-third of the boys and girls stated that both parents punished. However, there was a tendency for the parent to punish the child of the same sex, for 35 per cent boys and 23 per cent girls said the father usually punished, while 24 per cent boys and 36 per cent girls said the mother did so. Children prefer (Item 41) the mother to administer the punishment in 72 per cent of the cases, the father in 16 per cent, with no age or sex differences shown. The mother was more lenient in punishment (Item 46) according to 47 per cent (boys 52 per cent, girls 43 per cent) of the group, the father in 18 per cent (boys 16 per cent, girls 19 per cent), while 29 per cent (boys 23 per cent, girls 34 per cent) thought the parents were equally lenient. Ten per cent thought the father should punish more often than he did (Item 44), 22 per cent less often, and 53 per cent the same. Twelve per cent thought the mother should punish more often (Item 45), 22 per cent less often, and 56 per cent the same. There were no age or sex differences on these two questions. Apparently the parents shared rather equally the punishing of the children. The mother's punishment was preferred because she was a little more lenient. On the whole only one child in five felt unjustly punished.

Seventy per cent of the total group (63 per cent boys, 76 per cent girls) reported how the father punished (Item 42), while 76 per cent (68 per cent boys, 82 per cent girls) reported how the mother punished (Item 43). The greater use of physical punishment with boys may affect their willingness to report this item. Verbal punishment was used by the father in 30 per cent of cases and by the mother in 38 per cent, physical punishment by the father in 51 per cent and by mother in 37 per cent, and deprivation by father in 19 per cent and by mother in 25 per cent. The data do not tell whether the father preferred physical forms or whether he punished the forms of bad behavior seeming to necessitate this.

Parents apparently both showed some discrimination between the sexes in choice of punishment. The father used verbal punishment, usually called scolding, for 15 per cent boys and 41 per cent girls. For the boys he used

64 per cent physical forms and for the girls 41 per cent. Boys stated the instrument used twice as often as girls, which incidentally, was usually the hand or a strap. Deprivation was used by the father for 21 per cent boys and 18 per cent girls. Sending to bed or to bedroom was the most popular form of deprivation. The mother used verbal punishment for 29 per cent boys and 45 per cent girls, physical punishment for 45 per cent boys and 30 per cent girls, and deprivation for 26 per cent boys and 25 per cent girls. The mother tended to utilize scolding and deprivation somewhat more often than the father whereas he delivered more physical forms. Both parents more often used verbal punishment with girls and physical forms with boys, the father was more partial than the mother in this respect.

d. Teasing. There were 36 per cent (31 per cent boys and 40 per cent girls) of children who said they liked to have the father tease them (Item 24). Some children qualified this by saying, "Sometimes I do." A like number, 37 per cent (38 per cent boys and 36 per cent girls), did not like to be teased. The father's nickname (Item 23) was liked by 55 per cent (63 per cent boys, 48 per cent girls) and disliked by 13 per cent (7 per cent boys, 18 per cent girls). Apparently girls are somewhat more sensitive to nicknames than boys. Boys named 81 ways in which the father teased them of which 28 per cent were probably a father's way of showing affection, such as tickling, pinching, etc. Girls named 125 ways of which 42 per cent were presumably forms of affection. Boys named 34 ways in which their father made them afraid of which 47 per cent were usual forms of teasing. Girls named 40 ways of which 60 per cent were forms of teasing. Teasing might be pleasant modes of showing affection. However, it was unpleasant to about one-third of the children and sometimes produced fears.

e. Favoritism and sibling jealousy. The data permitted several interesting approaches to the problem of jealousy among siblings. The subject asked in two questions (Items 17, 18) whether the father liked a brother or a sister better than him. To the one or other of these questions 24 per cent of children in families of two or more children answered affirmatively. To a similar pair of questions relative to the mother (Items 26, 27), 27 per cent answered affirmatively. These averages no doubt represent the minimum number of children who felt a parent liked another sibling better. There were one-sixth more instances in the questions above that were first answered positively and then erased. The results from another question concerning play also indicated this. It would be probable that a parent would play more with the preferred child. To a pair of questions asking whether the father played more (Items 6, 7) with a brother or sister than with the subject, 30 per cent answered positively.

The question could be raised whether it is justified to infer a subjective condition of jealousy on the basis of recognition of greater parental affection for another child. Probably, direct questions concerning the subjective condition of jealousy would bring less accurate results than the questions mentioned above.

In families of two or more children boys showed 56 per cent cases of jealousy for the two parents combined while girls had 42 per cent. Many factors may affect this slight difference. Girls were more free and frank on most questions to give additional data and had only slightly more, 14, erasures than boys, 9, on the questions involved in this section. The more severe punishment given boys by both parents, the father's possible preference for girls in recreation, the greater amount of bossing of the father, and the trend of preference for the mother's disposition and services, were undoubtedly factors to be considered. When a child was jealous of another sibling for the father's affection, there was a strong tendency also to be jealous of this child in relation to the mother as well. There was practically no indication of cross-parent fixation, since in the case of the father, the boys (25 per cent) and the girls (23 per cent) were equal in the frequency of jealousy in families of two or more siblings. In the case of the mother the boys (31 per cent) tended to be slightly more concerned than the girls (26 per cent) for her affection.

Data in Table 6 indicate some interesting effects of size of family upon the amount of jealousy. The two-sibling family apparently was a special case with boys more often jealous of the other boy than of the sister for the regard of both parents while the girl was more jealous of the boy than of the sister. The trend was the same when the proportion of like- and unlike-sex siblings within a sex was considered. In the larger families the trend was quite consistently reversed with boys jealous of the affection of sisters in the case of both parents and girls jealous of sisters in the case of both parents with but slight exception. The family of five or more siblings was substantially a situation fostering more jealousy for both sexes about alike; perhaps there was felt a real lack of enough parental affection in this situation or perhaps the competition for material things was generally heightened here. Five per cent of children felt the father liked both a brother and a sister better than they; the same condition existed relative to the mother in 6 per cent of cases. Such instances were nearly three times more frequent in families of five or more children than in those of three or four. This duplication appears in column of "both sexes" in Table 6.

f. Home duties. Several questions dealt with the chores the parents asked

TABLE 6

Showing Percentage of Children in Families of Varying Sizes Including Preference by the Parents for Siblings of the Same and Opposite Sex

		Father									Mother								
		Boys				Girls					Boys				Girls				
	No. cases	Like sex	Unlike sex	Both Sexes	All	Like sex	Unlike sex	Both sexes	All	All	Like Sex	Unlike sex	Both sexes	All	Like sex	Unlike sex	Both sexes	All	All
2 siblings	95*	13	7	—	20	2	6	—	8	14	16	11	—	27	4	12	—	16	22
3 siblings	70	3	13	6	22	16	8	0	24	23	6	6	6	19	8	5	5	16	17
4 siblings	54	4	8	0	12	14	7	7	29	20	8	12	12	31	11	4	4	18	24
5 or more siblings	89	9	17	13	38	14	5	10	29	34	11	17	17	45	10	17	7	33	39
Total	308	8	11	5	25	11	6	4	21	23	11	12	9	31	8	10	4	21	26
3 or more siblings	213	6	13	8	27	15	6	6	27	27	10	12	12	33	9	9	6	24	28

*Boys had 25 like-sex and 20 unlike-sex siblings; girls had 20 like-sex and 30 unlike-sex siblings.

of the children to see what light these might throw upon attitudes. In the group, 11 per cent preferred to help the mother (Item 16), 7 per cent the father, and 77 per cent helped both with no preference. The chores of the mother (Item 15) would be omitted by 35 per cent if they had little time, and those of the father by 40 per cent. These percentages were interesting in view of the mother's numerous requests for help. No age or sex differences appeared in either of these questions. By teasing, children could get out of the father's chores (Item 13) often in 13 per cent of cases, and occasionally in 41 per cent. The question was omitted by 43 per cent. To the same question with reference to the mother (Item 11) 12 per cent answered often, and 58 per cent occasionally. This question was omitted by 30 per cent. In the case of both parents girls could occasionally get out of chores better than the boys or thought they could. There was a 74 per cent of agreement (63 per cent boys, 84 per cent girls) that the mother asked more chores (Item 14) while 15 per cent (24 per cent boys, 8 per cent girls) thought the father asked more chores. The parents were inclined to ask more chores of the child of the same sex.

The children were asked to list the chores commonly asked by the mother (Item 10) and then those (Item 12) by the father. There appeared considerable difference between the parental requirements in this regard. In many questions there has seemed a slight preference for the mother in affection and regard. Apparently requests for help does not diminish this affection to any extent. In the case of the mother 9 per cent failed to list any chores, while 28 per cent listed none for the father. In the case of the mother 23 per cent of the children (35 per cent boys, 13 per cent girls) listed one chore, 30 per cent (31 per cent boys, 30 per cent girls) two chores, 28 per cent (20 per cent boys, 52 per cent girls) three chores, and 9 per cent (14 per cent boys, 5 per cent girls) four or more. In the case of the father 50 per cent (43 per cent boys, 56 per cent girls) named one chore, 19 per cent (14 per cent boys, 23 per cent girls) two chores, and 3 per cent (0 per cent boys, 5 per cent girls) three or more chores. The fifth grade listed 43 per cent of the mother's and 45 per cent of the father's chores, while the sixth grade listed 57 per cent of the mother's and 55 per cent of the father's. Of all the mother's chores the girls named 63 per cent and boys 37 per cent, while of all the father's chores the girls named 57 per cent and the boys 42 per cent. Apparently the mother and father asked more chores of girls than of boys, which would be expected in view of their place in the home. It also appears that girls were either more willing and submissive to work, or more suited to the work of the home, or less interested in doing other things than boys. The most extreme devotion or coercion perhaps, measured by most chores done, came from the child of unlike sex.

What chores did the mother request of the children? The entire group named 826 chores of which 27 per cent were washing dishes, 23 per cent running errands (store, about house), 16 per cent sweeping and dusting, and 11 per cent making beds. Children of the sixth grade more often made beds and helped with meals whereas fifth grade children more often took care of pets, emptied garbage cans and waste baskets. There was some differentiation of tasks for the sexes. Of the 308 chores mentioned by the boys that the mother requested, 38 per cent were errands, 17 per cent washing dishes, 10 per cent care of garbage and ash cans, 8 per cent sweeping and dusting, 8 per cent care of lawn and garden. Of the 518 chores mentioned by girls 33 per cent were dish washing, 21 per cent sweeping and dusting, 15 per cent making beds, 14 per cent running errands, and 6 per cent getting meals. The girls had somewhat more strictly domestic duties.

What chores did the father request of the children? On the questionnaire the children actually wrote the mother's chores first and perhaps did less well on the repeated question with reference to the father or perhaps the father and mother were not readily differentiated in their chore requirements. The children only named 393 chores for the father of which 29 per cent were errands to the store, 22 per cent care of the lawn and garden, 11 percent personal service (getting pipe, shoes, etc.), 6 per cent washing the car, 6 per cent care of garbage, 5 per cent washing dishes, and 5 per cent cleaning and dusting. The fifth grade helped somewhat more often with garden and lawn and did more personal service for the fathers while the sixth grade children ran more errands. Of the 166 chores mentioned by boys, 31 per cent were errands, 27 per cent care of lawn and garden, 11 per cent emptying garbage, 8 per cent washing car, and 4 per cent personal service. Of the 277 chores mentioned by girls 28 per cent were errands to the store, 19 per cent care of lawn and garden, 16 per cent personal service to the father, 7 per cent cleaning and dusting, 6 per cent washing dishes, and 6 per cent helping the mother. The father therefore more often asked boys to do tasks requiring strength and preferred the girls for doing personal services for him.

5. *Effects of Sex Upon Father-Child Relationships*

On the whole the sexes were fairly equally represented in the various groups with but slight exception. The group as a whole had 47 per cent male and 53 per cent females. Sexes in the grades were fairly equally distributed with 21 per cent boys and 23 per cent girls in the fifth grade, and

26 per cent boys and 30 per cent girls in the sixth grade. The younger the age group the more girls there were and the older the group, the more boys. Ten-year-olds had 38 per cent boys, 62 per cent girls, eleven-year-olds 43 per cent boys and 57 per cent girls, twelve-year-olds 56 per cent boys and 44 per cent girls, and the thirteen- to fifteen-year-olds 74 per cent boys and 26 per cent girls. The smaller the families, the more girls; in general the larger the families, the more boys. Only-children were 36 per cent males and 64 per cent females. Two-child families had 46 per cent boys and 54 per cent girls. Sexes were equal in three-, four-, and five-children families. There were 55 per cent boys and 44 per cent girls in families of six or more children. Sexes were equally represented in oldest and youngest groups.

Greater sensitivity, perhaps dissatisfaction, with the father-child relationship was expressed by boys on the negative list of criticisms (boys 6.3 items, girls 5.4) and on the positive list (boys 4.0, girls 3.5). Although girls gave more additional criticisms on both lists, this may have been partly due to their willingness to write more, rather than to a feeling of criticism. Additions to the positive list showed the sexes equal in a desire for more attention, more than twice as many girls desired more freedom, and twice as many boys desired more gifts. On the positive list both sexes disliked about equally items that represented poor dispositional qualities of the father. Differences of treatment were reflected in the fact that more girls resented teasing than boys and more boys disliked shouting. The father's coming home late at night, and being away from home, were both more frequent criticisms for boys than girls. On the positive list both sexes indicated the usual pre-adolescent desire for more freedom and independence in such items as allowance, more money, more shows, and more play. Differences on such items as "talk more with me" (35 per cent boys, 28 per cent girls) and "punish me less" (35 per cent boys, 26 per cent girls) may actually represent the situation of more paternal pats for one sex and spanks for the other. However on the three items "put his arm around me," "show more affection," "give me more attention," both sexes were practically alike. Boys' larger score on "give me less chores" and girls' larger score on "more clothes" doubtlessly represent varied sex interests. A review of all these facts indicate the boys were slightly more critical and sensitive to the relationship with the father than girls. Possibly boys received slightly less attention. Girls were not more desirous of added paternal affection than boys.

The children did not express special affection for the parent of opposite sex, they agreed in giving the mother (34 per cent boys, 32 per cent girls) double the preference for the father (15 per cent boys, 13 per cent girls).

They also felt that the father (13 per cent boys, 17 per cent girls) and the mother (15 per cent boys, 18 per cent girls) loved them best in the same proportion of cases. Of these only 16 per cent returned the father's preference while 46 per cent returned her preference, without influence of the sex of the child shown. In desire for more paternal (37 per cent boys, 43 per cent girls) and maternal (33 per cent boys, 36 per cent girls) affection, the sexes were quite similar. If a child liked a parent better, the halo effect for the parent was somewhat greater in the case of the child of the same sex; thus of the children who liked the father better than the mother, 63 per cent boys and 32 per cent girls felt he understood them better, while 50 per cent boys and 41 per cent girls felt he was better natured. Similarly of those who liked the mother better, 64 per cent boys and 71 per cent girls felt she understood them better, while 68 per cent of both sexes thought she was better natured. There were 37 per cent boys and 43 per cent girls who wanted the father to show more love to them, while 33 per cent boys and 36 per cent girls wished the mother to show more love toward them. The attraction of the parent of unlike sex was not impressive.

Concerning paternal attributes as adopted goals, each sex gave a greater response for the parent of the same sex, for the father (boys 74 per cent, girls 80 per cent) and for the mother (boys 62 per cent, girls 87 per cent). Girls rated fathers nearly twice as high as boys in disposition and character traits while boys rated mothers somewhat higher than the girls on these two qualities. Each sex showed strong loyalty to the occupations of their own sex but girls more often expressed liking for work the father did (13 per cent) than boys for the mother's (3 per cent). Quite a number of boys expressed a desire "not to be like a woman" while no girls had such an expression relative to a man. Girls were more negatively critical of both parents than boys in regard to disposition and character traits. Both sexes were more negatively critical of the mother's appearance than of the father's.

Data from responses suggested that fathers played somewhat more with daughters; for 83 per cent girls and 76 per cent boys named activities, and 33 per cent boys and 46 per cent girls reported he played each day with them, and 75 per cent boys and 86 per cent girls thought he liked to play with them. Fathers were thought to be too busy to play with them by 33 per cent boys and 46 per cent girls. However the differences were not very great, but they tend to show fathers spent more play time with girls.

The mother was preferred 60 per cent (boys 54 per cent, girls 66 per cent) of times and father 28 per cent (boys 31 per cent, girls 25 per cent) in a group of 11 common services with a slight preference for the parent of like-sex. An apparent preference for the mother in a bad dream, hurt feelings, trouble in school or lost possession by the girls was largely due to boys' omission of responses to such items. Extreme cases who preferred the father for eight or more services were 88 per cent boys. Of those who went to father in one or no situation, 62 per cent were girls. Thus extreme preferences for services were most likely to be for the parent of like-sex because they liked them and got along better with them.

Punishment was given by the father in 29 per cent (35 per cent boys, 23 per cent girls) and by the mother in 30 per cent (24 per cent boys, 36 per cent girls) of cases; therefore there was a tendency for the parent to punish more often the child of like-sex. There were 52 per cent boys and 43 per cent girls who thought the mother was easier while 16 per cent boys and 19 per cent girls thought the father was easier. Punishment was reported for the father by 63 per cent boys and 76 per cent girls and for the mother by 68 per cent boys and 82 per cent girls. This difference in readiness to report may have been partly due to the more severe punishment used for boys than girls by both parents. The father punished by scolding 15 per cent boys and 41 per cent girls and by physical forms, 64 per cent boys and 41 per cent girls. The mother punished by scolding 29 per cent boys and 45 per cent girls and by physical forms 45 per cent boys and 30 per cent girls. This difference in punishment of the two sexes might be a partial explanation of the later trend of greater jealousy among boys than girls. The fact that the father used physical punishment in 51 per cent of cases and the mother in 37 per cent may have affected the popularity of the father. The father (58 per cent) was considered a "bigger boss at home" than the mother (25 per cent).

Girls (40 per cent) liked the father's teasing somewhat better than boys (31 per cent). Tickling, pinching, pulling hair, etc., perhaps a father's way of showing affection, were mentioned as forms of teasing by 28 per cent boys and 42 per cent girls.

The same number of boys (25 per cent) and girls (23 per cent) thought the father liked another sibling better, while there was a tendency that boys (31 per cent) were slightly more concerned than girls (26 per cent)for the mother's affection. In the two-sibling family both boys and girls were more jealous of a brother than of a sister while in families of three or more siblings both boys and girls were more jealous of a sister in the case of both parents. Boys showed slightly more jealousy (56 per cent) than girls (42 per cent) for both parents combined. No strong cross-parent fixation was shown in this data.

With regard to home duties there was little difference between the sexes as far as preference for working or for getting out of work with one parent. The evidence of devotion to one parent in terms of work was somewhat conflicting, for 63 per cent boys, 84 per cent girls thought the mother asked more work, and 24 per cent boys and 8 per cent girls thought the father did so. However, when mentioning actual duties four or more were mentioned for the mother by 14 per cent boys and 5 per cent girls, and three or more for the father by no boys and 5 per cent girls. Girls seemed to do more work than boys for both parents. For the mother boys mentioned 308 chores and girls 518, and for the father boys gave 166 and the girls 277. This seemed to be a larger discrepancy than the mere willingness of girls to write on a question would account for. This may also in part account for the fact that boys received more severe punishment in the home than girls. Girls did more strictly domestic duties for the mother than boys. The father asked boys to do heavier tasks and preferred girls for personal services, like getting his pipe and shoes.

E. SUMMARY

1. A questionnaire of 45 items concerning attitudes and activities of fathers was given to 388 children of the fifth and sixth grades. The group had the sexes represented equally, 47 per cent males and 53 per cent females. There were 44 per cent of the group in the fifth grade and 56 per cent in the sixth grade. Children came from families of three or less children in 61 per cent of cases.

2. Sensitivity to adjustment between father and child was measured by a negative list of 30 criticisms and a positive list of 15 acts a child might wish the father to do. For the group, the average negative criticisms was 5.8 (boys 6.3, girls 5.4) with 11 or more items checked by 28 per cent boys and 10 per cent girls, and for the average positive criticisms 3.7 (boys 4.0, girls 3.5) with 11 or more items checked by 8 per cent boys and 6 per cent girls. On the negative list boys were more critical or more frank than girls, but both sexes disliked the same things in the father, namely punishment, general irritability, poor adjustment with the mother, and absence from home. On the positive list both sexes desired similar things, such as an allowance, more money, more freedom to play and go to shows, and more conversation with the father. The fifth grade checked more items (negative list, 7.3; positive list, 4.4) than the sixth grade (negative list, 4.6; positive list, 3.2). Criticisms of the father tended to decrease from the tenth through the twelfth years. A change in this trend for the 13- to 15-year groups may

have been due to the small number in these groups or to the probability of problem cases among these over-age children. Sex and age did not seem to affect the content of the paternal criticism to any extent.

3. There were 15 per cent of the group who felt the father liked them best of all the children in the family, and 17 per cent who felt the same about the mother. Only 14 per cent said they liked the father a little better than the mother, while 32 per cent liked the mother better than the father. Of the group who felt the father liked them better, only 16 per cent liked him in return better than the mother, while 46 per cent of the group who felt the mother liked them better, liked her in return better than the father. In the entire group 40 per cent wished the father would show more love to them, while only 35 per cent wished the same about the mother. In 9 per cent of the cases the children felt the father understood them better and 35 per cent the mother. The father was considered easier to get along with by 13 per cent and the mother by 34 per cent. The father was considered the bigger boss by 58 per cent and the mother by only 25 per cent. Age and sex difference were not significant for the affection of children toward parents.

4. With regard to parental attributes children thought in positive terms rather than negative; for both, girls were more verbal. Children gave more attributes for the parent of like sex but rated the parent of opposite sex somewhat higher in disposition and character. Boys expressed a certain negative reaction to women's work and rôle that was not found in the girls' reactions to a man's work.

5. Fathers tended to spend more recreational time with daughters, for more girls reported activities with the father (76 per cent boys, 83 per cent girls), reported more daily play (33 per cent boys, 43 per cent girls) and thought he liked to play with them (75 per cent boys, 86 per cent girls).

6. In a group of 11 services children often required of parents, the father was preferred for a broken toy and need for money. The mother was nearly twice as popular for help on a lesson, or help in buying something and three times as popular in the case of a headache, a cut finger, loss of something, trouble in school, hurt feelings or a bad dream. In cases of extreme preference a like-sexed parent was preferred usually.

7. Punishment was given in 29 per cent cases by father, 30 per cent by the mother, and 33 per cent by both with a tendency for the parent to punish slightly more often the child of like-sex. The mother (47 per cent) was easier on the child than the father (78 per cent). Only one child in five felt unjustly punished. Both parents more often scolded girls and used physical punishment with boys.

8. Girls liked the father's teasing somewhat better than boys, due in part to the fact that his teasing in the former case was more often a way of showing affection.

9. There was a tendency for boys to show more jealousy than girls for both parents, particularly the mother. In the two-sibling family jealousy centered about a boy; in larger families, about a girl. Families of five or more siblings had more cases of jealousy than smaller families.

10. With regard to home duties, both sexes liked to help the mother (11 per cent) and the father (7 per cent) about the same, they omitted the father's (40 per cent) and the mother's (35 per cent) chores about equally readily, they teased out of the father's (13 per cent) and the mother's (12 per cent) chores equally easily, but they overwhelmingly agreed that the mother (74 per cent) asked more chores than the father (15 per cent). An extreme number of chores was listed by the child for the parent of opposite sex. Children listed more than double the number of chores for the mother than the father. Girls were more willing or submissive or suitable for work in the home than boys. There was some differentiation of duties according to sex.

11. Both sexes criticized similar things in the father, but boys were slightly more critical than girls. Children did not express special affection for the parent of opposite sex and agreed in giving the mother double the preference of the father. Both sexes desired no more affection from either parent. Each sex gave more ways in which they would like to resemble the parent of the same sex but rated the parent of opposite sex somewhat higher in disposition and character. Both sexes preferred the mother to the father for services, and extreme preferences was for the parent of like-sex. Parents tended to punish more often the child of the same sex and both parents used more physical punishment for boys than girls. In families of two siblings, both sexes showed more jealousy for a boy, while in larger families both showed more for a girl than for a boy. Girls did more chores for both parents than boys.

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SOME CHARACTERISTICS OF CHILDREN DESIGNATED AS MENTALLY RETARDED, AS PROBLEMS, AND AS GENIUSES BY TEACHERS*

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Teachers and specialists in child behavior are not always in agreement regarding children to be designated as problems, as retarded, and as geniuses. The data of this study present a picture of some factors which were influential in leading teachers to apply these designations to their pupils. The data here presented are of unusual value because they give the viewpoints of a representative cross-section of elementary school teachers of this country.

The committee known as Coördinated Studies in Education, Incorporated,[1] secured data relative to elementary school children from many widely separated localities. The data were gathered from 36 states, 310 communities, and 455 schools in the United States and include an elementary school population slightly in excess of 45,000 found in Grades 4 to 88, inclusive. Each child was given the Kuhlmann-Anderson Test, The Unit Scales of Attainment Battery Achievement Test, and the *BPC* Personal Inventory. They also were rated as to home and family background, father's occupation, economic status of the family, parental attitude toward child and home, and on the basis of 70 personality traits, 10 extra-curricular activities, and 21 hobbies.

The following instructions were given to the teachers:

> In the *R* column put a check mark for any child you class as extremely mentally retarded; in the *G* column check any child you rate as a genius; in the *P* column check any child you rate as a distinct problem.

It is important to note that no definitions were given of these three classifications. This means that the teachers were giving their judgments not only as to the children to be classified under the three headings but also as to what is a mentally retarded child, a genius, or a distinct problem.

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[1] The writer wishes to acknowledge his indebtedness to the Advisory Committee of Coördinated Studies in Education, Incorporated. He also acknowledges his indebtedness to Dr. William McGehee and Dr. Ruth Moncreiff who first worked up the data on retarded and problem children.

This study deals with children whom teachers have selected as mentally retarded, geniuses, or as distinct problems. The writer believes that this gives the data unusual value since it makes possible the determination, to some degree, of the characteristics which ordinary class-room teachers believe differentiate these three groups of children. Norms also are available on unselected children from the same groups and these make possible a comparison of the teacher-selected groups with "average" children in the same grades and schools.

The teachers selected 3,359 pupils, 2,138 boys and 1,221 girls, as retarded mentally. This is 7.3 per cent of all the pupils, or 8.8 per cent of the boys and 5.6 per cent of the girls. The problem group is made up of 2,041 children, 1,567 boys and 474 girls, which is 4.4 per cent of all the children, or 6.5 per cent of the boys and 2.1 per cent of the girls. The teachers selected very few children as geniuses—the group includes only 341 children, 158 boys and 183 girls. Thus, only .74 per cent of all children were selected as geniuses, .65 per cent of the boys and .83 per cent of the girls.

Sex differences are evident in these selections. A superior adjustment of the girls to the school situation, or, inversely, an inferior adjustment of the boys is indicated. Sixty-three per cent of the retarded group are boys, 37 per cent are girls. The boys appear to even greater disadvantage in the problem group. Seventy-seven per cent are boys and only 23 per cent girls. Thus, 3.3 times as many boys as girls are designated as problems. This is probably very close to the average of other studies, although in some the differences are as great as four or five to one. These sex differences indicate that boys do not find that the present elementary school set-up meets their needs. Several explanations might be offered: the curriculum may be better adapted to the girls, the boys may be handicapped by a slower rate of mental development, the preponderance of women teachers may be unfavorable to the boys, girls may be less aggressive and more incline to conform to the school situation, boys may have been conditioned by adults against school, and accordingly, not expect to be happy in school.

The differences are not so unfavorable to the boys of the genius group, composed of 46.5 per cent boys and 53.5 per cent girls. This is the most favorable consideration the boys receive but even so the percentages are lower than those reported in other studies. Terman and Burks (7, p. 778) have summarized the finding of studies relative to the sex distribution of gifted children and, in each case, more boys than girls are found. Witty's study showed a ratio of 104 boys to 100 girls, Goddard's 109 boys to 100 girls but, in other studies, the ratios are from 121 to 100 to 135 to 100 for elementary school pupils. The writer (2, pp. 12-13) dealing with the same population of elementary school pupils which is involved in this study, found that superior girls outnumbered superior boys 144.5 to 100. It must be recognized that these differences may be to some degree a function of the measuring instrument employed, the Kuhlmann-Anderson Test. It is necessary to recognize, I believe, that intelligence tests do not give reliable measures of sex differences (5, pp. 305-6).

Table 1 shows that each group is composed of a rather wide distribution of mental ability. Even though the teachers were instructed to check those who were "extremely mentally retarded" it is apparent that many are designated as retarded who are shown not to be so by the standardized test. McGehee (3, pp. 5-6) has shown that only 52 per cent of this group fall within the lowest 10 per cent in intelligence. That is, 48 per cent of this teacher-designated group can scarcely be regarded as mentally retarded and certainly not as "extremely mentally retarded." It is to be noted that some of these retarded children are average or, in exceptional cases, even superior in ability as indicated by the test.

TABLE 1
THE PERCENTAGE DISTRIBUTION OF THE INTELLIGENCE QUOTIENTS OF NORMATIVE, RETARDED, PROBLEM AND GENIUS CHILDREN

IQ range	Norm	Retarded	Problem	Genius
120 and above	5.4	.2	2.3	39.7
110-119	19.2	.7	6.3	33.2
90-109	55.7	25.3	42.9	22.2
80- 89	13.9	37.2	27.0	2.9
70- 79	4.6	25.5	15.3	1.4
Below 70	1.2	11.6	6.2	.6

The genius group shows an equal range of mental ability. Fifty-seven per cent of this group fall within the upper 10 per cent in mental ability, that is, attained intelligence quotients higher than the lower limits of the upper ten per cent (2, p. 15). Thus, 43 per cent of the group designated as geniuses are not of superior mental ability as measured by the standardized intelligence test. There are at least three possible interpretations of this: (*a*) the teachers did not interpret the term, genius, as applying solely to superior mental ability; (*b*) teachers may have been very poor judges of the mental capacities of their pupils (1, pp. 46-7); (*c*) the test scores may have underrated many of the children because of any one of a number of things that influence test results, namely, emotional disturbances, illness, and the like. These data appear to offer some grounds for concluding that teachers fail at times to judge correctly the potential learning capacity of their pupils.

This does not necessarily imply a lack of ability on the part of the teachers. Their judgments must be based very largely on the pupil's classroom achievements which may or may not correlate closely with measured ability.

Low intelligence, it is evident, is only one factor in problem behavior. Only 48 per cent fall in which might be called the dull and retarded groups, that is, have intelligence quotients below 90. Over half of this group, 51.5 per cent, have at least average ability or better. A few fall definitely in the superior group.

Both the retarded and problem groups are retarded relative to chronological age. They are, as a group, older than the average child in this study. The retardation of the mentally retarded group is approximately twice that of the problem group. In other words, the average retardation of the problem group for both boys and girls is .75 years whereas the retardation of the retarded group averages 1.55 years for the boys and 1.45 years for the girls. The genius group is accelerated to some degree since the boys of this group average .4 years and the girls .26 years younger than the average for their grades.

PERSONALITY CHARACTERISTICS

Teachers were asked to rate their pupils on 70 personality traits. These ratings were to be made before any tests were given in order that the ratings would not be influenced by test results. The following instructions were given.

> There are two columns just beneath this. In the one to the right there are 70 personality traits or general characteristics. Study these points carefully and in the large blank column put the numbers of the traits or characteristics which are MOST descriptive of each child in your estimation. You can pick out at least five of these for almost any child; you probably should not pick out more than 10 or 12. Be sure to rate each child and be sure that all characteristics noted for each child are outstandingly descriptive of him.

The 70 traits were rated by 50 mental hygienists and composite evaluations were obtained, ratings from 1 to 5 being assigned. A rating of 5 indicates that the trait is regarded as having definite hygienic value, a rating of 1 as being definitely undesirable or very harmful to the mental health of the child. The purpose of this phase of the study is to investigate the personality traits which are most frequently assigned to each of the three groups of children, genius, problem, and mentally retarded.

The traits listed in Table 2 are those considered by mental hygienists as being those of the 70 traits having the most definite hygienic value. It is note-

TABLE 2

The Percentage of Normative Genius Retarded and Problem Children Assigned Traits Which Are Rated by Mental Hygienists as Having Definite Hygienic Value

Trait	Norm	Genius	Retarded	Problem
		Boys		
Dependable	31.1	60.8	10.5	6.3
Friendly	32.5	47.1	13.9	12.0
Happy	37.8	49.6	22.6	16.7
Honest	32.5	42.8	17.9	10.8
Likes jokes	19.4	30.4	10.2	11.9
Original	10.0	45.8	1.4	4.9
Self-controlled	6.9	9.2	2.3	.9
Self-reliant	8.0	21.1	1.3	2.6
		Girls		
Dependable	42.2	73.0	16.3	9.6
Friendly	36.4	58.6	12.4	11.5
Happy	43.4	53.8	24.6	16.5
Honest	37.0	51.2	22.0	13.4
Likes jokes	12.6	17.6	6.4	6.3
Original	10.9	47.6	.7	3.8
Self-controlled	9.1	11.2	3.4	2.0
Self-reliant	10.0	21.3	1.1	2.1

worthy that in every instance the genius group is assigned the trait more frequently than the normative group and that both the retarded and problem groups are assigned the traits less frequently than the normative group. The genius group is, in no instance, assigned a given trait less than twice as frequently as either the retarded or problem group. The traits on which the teachers rated the groups as differing the least are *happy, friendly,* and *honest.* The greatest differences are found on the traits, *dependable, original,* and *self-reliant.* Again, the problem group is assigned these eight most desirable traits less frequently than the retarded group, with two exceptions. These two exceptions are *original* and *self-reliant.* All of these differences are large enough to be statistically reliable except when the retarded and problem groups are compared on *friendliness* and *likes jokes* and the genius and normative groups are compared on *self-control.*

Table 3 presents ratings of the various groups on traits which were given a ranking of 4 by mental hygienists, indicating that the traits have some hygienic value but not as much as some others. A perusal of the table reveals that the genius group is again accredited with possessing these desirable traits to a greater degree than any of the other three groups. The children of the genius group are rated as possessing these traits at least twice as frequently as the retarded and problem children with the exception of *energetic,* where the ratio drops to 1.6 to 1.

TABLE 3
THE PERCENTAGE OF NORMATIVE GENIUS, RETARDED AND PROBLEM CHILDREN ASSIGNED TRAITS WHICH ARE RATED AS HAVING SOME HYGIENIC VALUE BUT NOT AS MUCH AS SOME OTHERS

Trait	Norm	Genius	Retarded	Problem
		Boys		
Adventuresome	14.2	29.8	5.9	15.0
Ambitious	21.7	66.1	4.5	6.3
Artistic	7.3	29.1	4.2	4.0
Energetic	24.4	31.6	14.8	19.8
Generous	17.0	24.2	10.4	6.7
Investigative	11.7	44.0	2.0	4.3
Leader	7.2	31.0	1.3	3.6
Persistent	12.4	16.1	6.1	3.1
Polite	32.2	34.6	20.3	10.2
Precocious	3.4	38.4	.2	2.1
Systematic	3.1	13.6	.6	.9
		Girls		
Adventuresome	8.1	28.5	1.7	8.0
Ambitious	33.9	75.6	5.4	9.9
Artistic	15.6	41.1	5.8	6.8
Energetic	21.2	32.0	10.4	14.6
Generous	21.8	32.0	15.2	10.9
Investigative	7.5	22.4	.9	3.7
Leader	9.9	38.4	1.7	4.2
Persistent	15.3	25.2	7.0	7.1
Polite	44.1	38.4	32.0	19.2
Precocious	4.3	34.2	.2	3.5
Systematic	6.1	10.4	1.7	1.9

The children who were selected as geniuses are assigned six of these traits from 7 to 15 times as frequently as the other two groups. The distinctive characteristics of the genius group are *ambitious, artistic, investigative, leader, precocious,* and *systematic*. All the differences are statistically reliable, as far as the genius group is concerned when compared with the other groups, except for *physically energetic, generous,* and *persistent,* in the case of the boys and *polite,* in the case of the girls.

The problem compares much more favorably with the retarded group on the traits rated 4 than it does on the most desirable traits. They are rated as manifesting seven of these traits more frequently than the retarded group. These traits are *adventuresome, ambitious, artistic, energetic physically, investigative, leader,* and *precocious.* The differences between the retarded and the problem groups are mathematically reliable except in the case of *artistic* and *systematic,* for both boys and girls, and *persistent* for girls. There is no definite clue here as to why these children were selected as problems.

The retarded group rates inferior to both the normative and the genius groups on every one of these traits and the differences are large enough to be statistically reliable. The same is true of the problem group except on the trait, *adventuresome.*

Nine traits were rated by the mental hygienists as having no particular significance. The distribution of these traits is significant in revealing what teachers have in mind when they designate certain children as problems. Two of these traits are rated as being particularly characteristic of genius children but the differences are small and not reliable. These traits are *sympathetic* and *tidy,* traits which will probably attract favorable attention from teachers. These traits are assigned relatively infrequently to the problem group.

The relative great frequency with which the problem groups are checked as *disturbing class* gives an important clue to why they are listed as problems. Other traits in this group which are assigned more frequently to problem children are *domineering—but not cruel, sex-conscious, talkative, uses tobacco, whispering, writes notes.* These differences are statistically reliable in all cases when comparisons are made with the normative group. The same is true when the four groups are compared on *disturbing class* and *talkative, verbose* for both boys and girls, *domineering,* excepting the genius group, and *tidy* in the case of the girls. These are all traits which are apt to antagonize the teacher and turn her against the child.

We see here the difference in the attitudes of teachers and mental hygienists toward problem children. Mental hygienists rate these traits as being of no particular significance yet the fact that the teachers assign certain of them to problem children with so much greater frequency indicates that teachers believe that the traits are sufficiently important to designate certain children as problems.

The differences between the retarded and normative groups are not so striking. Both boys and girls of the retarded group are rated as *disturbing class* more and as being more *sex-conscious.* The differences are statistically reliable for both boys and girls, on the latter trait, and for the boys on the first named trait. The retarded boys *use tobacco* more. This difference is also reliable. The retarded girls are significantly less *domineering* and both boys and girls are significantly less *sympathetic* and *tidy* than the average.

Equally significant differences are found when the groups are compared relative to those traits rated as undesirable or harmful by mental hygienists. A number of these traits are accredited to the genius group, as compared with the normative group, so much less frequently as to give statistically reliable differences. These traits, in the case of both boys and girls, are *day-dreaming, disobedient, dull, immature, inattentive in class, irregular in school attendance, lack of interest in work, lazy, "quitter," "sissy or tomboy,"* and *suggestible,* in the case of boys only, *cute or "cocky," rude, self-conscious, slovenly or dirty,* and in the case of the girls only, *sickly.* It is to be noted that these are traits the absence of which tends to make for successful school adjustment. The only traits with which they are accredited more frequently than the normative group are *impatient with others, over-critical of others,* and *selfish,* but these differences are not great enough to yield statistical reliability.

Traits which appear to be definitely characteristic of the retarded group, that is, they are assigned to this group with sufficiently greater frequency to provide statistically reliable differences, are *day-dreaming, dull and mentally sluggish, lack of interest in work, lazy, nervous or restless,* and *slovenly or dirty.* There are, in addition, other traits which are assigned to the retarded group with sufficiently greater frequency than to any other group except the problem group to give statistically significant differences. These traits are *cheating, destructive, disobedient, immature, inattentive in class, irregular in school attendance, lying, quarrelsome, "quitter," stubborn,* and *tardiness.*

Traits in this group which distinguish the problem group from the normative and genius groups, since the differences are statistically reliable, are, for both boys and girls, *cheating, cute or "cocky," destructive, disobedient, impetuous in own actions, impatient with others, lying, nervous or restless, over-critical of others, pouting* or *resentful, profane, quarrelsome, rude* or *defiant, selfish, stubborn, temper tantrums,* and, for the boys only, *"sissy,"* and *stealing.* It is to be noted that, almost without exception, these are traits which would tend to bring the child into conflict with the teacher. It seems evident that here, in part at least, we have a major reason for the selection of these children as problems.

Five traits—*cruel, bully type; dishonest or unreliable; over-sensitive about self; unhappy, depressed, moody; will not work or play with others*—were rated 1 by the mental hygienists. This means that they were considered as being definitely or unequivocally undesirable or very harmful to the mental health of the child. The teachers did not assign these traits to very many children, the highest percentages in the normative group being *cruel or bully type,* 11.2 per cent for boys, and *over-sensitive about self* to about 10 per cent of both boys and girls. These traits were assigned to the genius group relatively infrequently and the only statistically reliable difference is on the trait, *over-sensitive about self,* which is less characteristic of this group than of any other.

These traits are more characteristic of the retarded group than of either the normative or genius group. Differences are statistically reliable on the following traits: *unhappy or depressed,* and *will not work or play with others,* both boys and girls, *dishonest,* boys, and *over-sensitive about self,* girls.

Two traits are characteristic of the problem group, *cruel, bully type* and *dishonest or unreliable.* These traits were assigned to them more than twice as often as to any other group and the differences are reliable. They also are credited with the traits, *unhappy, depressed* and *will not work or play with others* with a mathematically reliable greater frequency than the normative group.

Tables 4 and 5 reveal positive factors which operated in the selection of the three groups. Every trait found in the list of the 10 most frequently assigned to the genius group is rated by the mental hygienists as having definite hygienic value, with one exception. This exception is *tidy,* for girls, and would no doubt be rated very high by teachers, if not by mental hygienists. Five of the traits assigned most frequently to the boys of the genius group are rated 5 and the other five are rated 4 and, for the girls, five traits are rated 5, four traits 4, and one trait 3. Thus, five of the eight traits rated 5 compose half of the 10 traits assigned most frequently to the genius group.

The ratings of traits assigned most often to the normative group do not differ materially from those of the traits assigned with greatest frequency to genius children. Teachers, however, find the children designated as geniuses to possess the desirable traits to a greater degree than average children. Eight traits, for boys, and six traits, for girls, are assigned more frequently to genius children than any trait is assigned to the normative group. Two traits, *ambitious* and *dependable,* are assigned to over 70 per cent of the girls and to over 60 per cent of the boys. Three traits are particularly characteristic of the genius group, *ambitious, dependable* and *original. Investigative* and *precocious* are significant for the boys and *leadership* for the girls.

Dullness, as might be expected, is the most distinctive characteristic of the retarded children, slightly less than 70 per cent being so designated. This is the most important distinction which the teachers made between the problem and retarded children, although the problems are definitely those who are class-room disturbers, as indicated by the 10 traits most often used to describe them.

The traits most characteristic of the retarded group are, on the whole,

TABLE 4

THE 10 TRAITS ASSIGNED WITH THE GREATEST FREQUENCY TO THE NORMATIVE, GENIUS, RETARDED AND PROBLEM GROUPS, SHOWING THE PERCENTAGE OF EACH GROUP TO WHOM THE TRAIT IS ASSIGNED AND THE MENTAL HYGIENISTS' RATINGS OF THE TRAITS

Normative			Genius			Retarded			Problem		
Trait	%	Rating	Trait	%	Rating	Trait	%	Rating	Trait	%	Rating
						Boys					
Happy	37.8	5	Ambitious	66.1	4	Dull	69.5	2	Inattentive	43.1	2
Honest	32.5	5	Dependable	60.8	5	Inattentive	42.2	2	Dull, sluggish	40.2	2
Friendly	32.3	5	Happy	49.6	5	No interest	35.8	2	Disturbs class	35.5	3
Polite	32.3	4	Friendly	47.1	5	Day-dreaming	30.4	2	No interest	33.4	2
Dependable	31.1	5	Original	45.8	5	Lazy	26.4	2	Cute; "cocky"	27.9	2
Energetic	24.4	4	Investigative	44.0	4	Happy	22.6	5	Day-dreaming	25.0	2
Ambitious	21.7	4	Honest	42.8	5	Polite	20.3	4	Lazy, sleepy	21.0	2
Tidy	20.4	3	Precocious	38.4	4	Disturbs class	18.1	3	Disobedient	20.4	2
Inattentive	20.0	2	Polite	34.7	4	Honest	17.9	5	Energetic	19.8	4
Likes jokes	19.4	5	Energetic	31.6	4	Energetic	14.8	4	Dishonest	18.6	1
						Girls					
Polite	44.1	4	Ambitious	75.6	4	Dull	67.8	2	Dull	40.5	2
Happy	43.4	5	Dependable	73.0	5	Polite	32.0	4	Inattentive	32.8	2
Dependable	42.2	5	Friendly	58.6	5	No interest	31.3	2	No interest	26.4	2
Honest	37.0	5	Happy	53.8	5	Inattentive	29.7	2	Nervous	23.6	2
Friendly	36.4	5	Honest	51.2	5	Day-dreaming	28.1	2	Day-dreaming	23.1	2
Ambitious	33.9	4	Original	47.5	5	Happy	24.6	5	Polite	18.2	4
Tidy	30.0	3	Tidy	41.6	3	Honest	22.0	5	Dishonest	18.3	1
Generous	21.8	4	Artistic	41.1	4	Over-sensitive	19.1	1	Cheating	17.0	2
Energetic	21.2	4	Leader	38.4	4	Tidy	16.7	3	Happy	16.5	5
Artistic	15.6	4	Polite	38.4	4	Dependable	16.3	5	Disturbs class	16.1	3
									Pouting	16.1	2

TABLE 5

THE 10 TRAITS ASSIGNED WITH THE LEAST FREQUENCY TO THE NORMATIVE, GENIUS, RETARDED AND PROBLEM GROUPS, SHOWING THE PERCENTAGE OF EACH GROUP TO WHOM THE TRAIT IS ASSIGNED AND THE MENTAL HYGIENISTS' RATINGS OF THE TRAITS*

Normative			Genius			Retarded			Problem		
Trait	%	Rating	Trait	%	Rating	Trait	%	Rating	Trait	%	Rating
						Boys					
Truant	.7	2	Destructive	.6	2	Precocious	.2	4	Self-controlled	.9	5
Isolationist	1.0	1	Cowardice	.6	2	Systematic	.6	4	Systematic	1.8	4
Profane	1.0	2	Profane	.6	2	Leader	1.3	4	Sympathetic	1.8	3
Temper tantrums	1.1	2	Rude; defiant	.6	2	Self-reliant	1.3	5	Precocious	2.1	4
Lying	1.3	2	Suggestible	.6	2	Original	1.4	5	Self-reliant	2.6	5
Suspicious	1.4	2	Suspicious	.6	2	Over-critical	1.7	2	Sickly	2.9	2
Cowardice	1.5	2	Lying	1.2	2	Temper	1.8	2	Isolationist	2.9	1
Sex conscious	1.6	3	Slovenly	1.2	2	Investigative	2.0	4	Persistent	3.1	4
Sickly	1.9	3	Tardiness	1.2	2	Self-control	2.3	5	Leader	3.6	4
Destructive	2.1	2	Uses tobacco	1.2	3	Selfish	2.4	2	Cowardice	3.9	2
			Isolationist	1.2	1						
						Girls					
Profane	.02	2	Sex-conscious	.0	3	Precocious	.2	4	Systematic	1.9	4
Stealing	.2	2	"Tomboy"	.0	2	Cruel	.4	1	Self-control	2.0	5
Truant	.4	2	Stealing	.0	2	Original	.7	5	Self-reliant	2.1	5
Cruel	.4	1	Too easily frightened	.0	2	Profane	.7	2	Too easily frightened	2.2	2
Lying	.7	2	Truant	.0	2	Domineering	.8	3	Cruel	3.0	1
Temper	1.0	2	Cruel	.4	1	Investigative	.9	4	Precocious	3.5	4
Rude	1.0	2	"Quitter"	.5	2	Truant	.9	2	Profane	3.6	2
Destructive	1.1	2	Suggestible	.5	2	Stealing	1.0	2	Investigative	3.7	4
Suspicious	1.1	2	Temper	.5	2	"Tomboy"	1.0	2	Original	3.8	5
"Tomboy"	1.2	2	Isolationist	.5	1	Self-reliant	1.1	5	Domineering	4.2	3
			Unhappy	.5	1				Leader	4.2	4
			Writes notes	.5	3				Sympathetic	4.2	3

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*Gambling and "Goody-goody," for both boys and girls, "Sissy," too easily frightened, and writes notes, for the boys, physical cowardice and uses tobacco, for the girls, were omitted as not significant for this table since they were not used by the teachers.

not so undesirable as those characterizing the problem children. Four of the traits most frequently assigned to retarded boys and girls are rated as having some hygienic value while five are rated as being harmful. Two only of the traits most frequently assigned to problem children are rated as having hygienic value, whereas eight of the 10 are rated as being harmful. Six of the traits most frequently assigned to retarded boys, and five out of the 10, for girls, would probably be annoying to the teacher. On the other hand, nine out of 10, and perhaps all 10, of the traits most frequently assigned to problem boys and nine of the 11, for girls, would undoubtedly be a source of annoyance for most teachers. It appears that problem children, from the teachers' viewpoint, are children who are classroom disturbers, children who do not fit into the classroom decorum, who do not successfully adjust themselves to the classroom situation.

The ratings of traits assigned with the least frequency to the four selected groups are enlightening (Table 5). None of the traits which are least characteristic of the genius and normative groups are rated as having definite hygienic value. The situation is different with the retarded and problem group. Seven of the traits assigned with least frequency to retarded boys are rated beneficial and, for the girls, four are rated beneficial. Of the traits assigned with least frequency to the problem group, for the boys, six are rated beneficial and, for the girls, seven out of 12 are rated beneficial. This is the reverse of the picture presented relative to the 10 traits assigned with least frequency to the genius and normative groups.

Traits which the teachers do not find to be characteristic of either the retarded or problem groups are *precocious, self-reliant, leadership, systematic, self-control, originality,* and *investigativeness.* The problem boys are found to be lacking in persistence.

Probably the most significant fact about the personality characterizations of the teachers is the very definite picture they give of children they check as geniuses. Some traits are credited to well over half of the children and to 75 per cent in one case. It is evident that this is a group with very outstanding personalities since no such trait distributions are to be found relative to the other groups. One might expect an equally definite characterization of the problem group. The highest percentage, however, for any trait with the problem group is 43 per cent. This may not mean that they are not as distinctive personalities as the genius children since it may be merely an expression of the reluctance of teachers to use the undesirable traits. Either undesirable traits are not found in children to the degree that desirable traits are or a child has to manifest an undesirable trait to a far greater degree than a desirable trait before the teacher will assign the trait to him. This may be the reason genius children appear to have much more distinctive personalities than problem children.

The traits which teachers, as indicated by their ratings, consider as most characteristic of genius, in order of the frequency of assignment, are *ambitious, dependable, original, precocious, artistic, leader, investigative, adventuresome,* and *self-reliant.*

It is difficult to find any trait which clearly distinguishes the retarded group from the problem group unless it is the trait *dull.* Traits which tend to distinguish the retarded and problems from the genius and normative groups are *day-dreaming, dull, inattention in class, lack of interest in work, over-sensitive about self, "quitter," sleepy or apathetic or lazy, unhappy or moody or depressed, will not work or play with others.*

There are a number of traits which distinguish the problem group from the other three groups in the opinion of the teacher: *disturbs class, talkative or verbose, cheating, cruel or bully type, cute or "cocky," dishonest, disobedient, destructive, immature, impetuous in own actions, lying, nervous or restless, over-critical of others, pouting or resentful, profane, quarrelsome, rude or defiant, selfish, stubborn,* and *suspicious type.* This emphasizes that problem children, as far as teachers are concerned, are children who are active, aggressive, and generally maladjusted to the classroom situation.

The fact that teachers do not have the same conception of problem children as mental hygienists is emphasized by the tendency of teachers to characterize problem children by the traits just listed and by their failure to use, except in relatively rare cases, such traits as *self-conscious, suggestible, suspicious, temper tantrums, too easily frightened, over-sensitive about self, unhappy or moody or depressed, will not work or play with others.* That is, they fail to see as problem behavior the withdrawing and ego-centric type of behavior which mental hygienists emphasize.

PERSONAL INVENTORY SCORES

The *BPC* Personal Inventory was given to the children in Grades 5 to 8, inclusive. It was omitted in the 4th grade because the language of the Inventory was judged too difficult for children of that age.

It has been shown that *P*-scores on this Inventory vary with the general level of intelligence of the group (4, p. 92). That is, the higher the general level of intelligence of a group the lower the average *P*-score. This may be interpreted to mean that children of superior intelligence tend to make lower *P*-scores because they are more stable emotionally, whereas those of lower intelligence tend to be more unstable emotionally. There is also the possibility that the *P*-score on the Inventory is influenced somewhat by the child's intelligence. Personality tests of this type, while of little value in individual diagnosis, do appear to make distinctions between large groups. Thus, there does appear to be some basis for concluding that real differences in emotional stability exist between these groups.

The median *P*-scores for the boys and girls respectively are: normative 36.2 and 35.9; genius 31.3 and 24.1; retarded 44.9 and 42.0; problem 47.1 and 43.8. Comparing the median *P*-scores of these groups with those obtained by groups with comparable *IQ*'s, as worked out by Moncreiff (Table 6), we find that the girls of the genius group (median *IQ* 113 or low superior) average over five points below what would be expected—indicating a high degree of emotional stability. Other average *P*-scores are about what would be expected in terms of average *IQ*'s except for the problem group. Their *P*-scores are approximately the same as those of the retarded group although their average *IQ* is approximately 90 as compared with 83 for the retarded group.

TABLE 6
MEDIAN *p*-SCORE FOR EACH INTELLIGENCE LEVEL AND NORMATIVE PERCENTILE EQUIVALENTS

	Median score	Normative percentile equivalent	Median score	Normative percentile equivalent
	Boys		*Girls*	
Genius†	23.3	20th	25.0	25th
Very superior	30.6	35th	27.5	35th
Superior	33.7	40th	30.4	40th
Average	37.5	50th	34.3	50th
Dull normal	41.6	65th	42.0	65th
Dull	48.0	70th	46.0	75th
Feebleminded	59.2	85th	51.0	85th

*Taken from R. Moncreiff (4, p. 92).
†Based on Terman's classification.

INTERESTS

The teachers were given a list of 10 extra-curricular activities and 21 hobbies and asked to check those activities which the individual child pursued. The method some teachers used in checking extra-curricular activities tends to obscure differences. Many teachers failed to make any distinction between voluntary and compulsory activities, checking every child in the class on a given activity. Even though this was done a few relatively large differences are found relative to the four groups under consideration in this study.

Because no activity was listed for between 35 and 40 per cent of the children the numbers involved are small and few reliable differences are found.

The most significant finding is the superior interest of the genius group in some of these activities. Most striking is their interest in music, 57.6 per cent of the boys as compared with 36 per cent of the normative group, and 65.6 per cent of the girls, as compared with 40.4 per cent of the normative group, are listed as participating in the music activities of the school. These differences are statistically reliable. One other statistically reliable difference is found in favor of the genius group, a superior interest in dramatics. Other differences between the normative and genius group which are large enough to be noted include the superior interest of the boys of the genius group in organized sports and academic clubs, of both boys and girls in avocational and social clubs, scouting and campfire groups, and student government. The genius group are weakest in unorganized sports.

These interests probably reveal some reasons for the selection of these children as geniuses. It seems logical to conclude, on the basis of the differences revealed, that these children tend to stand out because of their intellectual and academic interests and because they are better integrated socially than the other children. They are actively interested in the school program and this has probably led to their recognition by the teachers as children of unusual ability.

It appears, on the other hand, that the retarded children are probably so designated, in part at least, because of their lack of intellectual and academic interests and because of their social retardation. They fall below the other groups on the basis of all comparisons except sports. The retarded boys have a superior interest in both organized and unorganized sports while the girls are slightly more interested in these activities than the normative group. It is quite possible that this superior interest is partly, if not wholly due to their greater chronological maturity since it has been shown that these interests grow rapidly with age during this period (2, p. 38; 3, p. 72).

The interests of the problem group vary little from what would be expected in terms of their age-intelligence status except in two instances. The most striking of these is the girls' interest in dramatics. While this interest does not equal that of the genius group, it is almost twice as great as that of either the normative or retarded group. Their interest in unorganized sports is greater than might be expected although it may merely be a chance variation. The problem girls compare more favorably than the problem boys relative to their interests in extra-curricular activities. This is true of participation in music, organized sports, dramatics, academic clubs, social clubs, campfire girls—in all of which their interests exceed those of the normative and retarded groups. A comparison of interest in extra-curricular activities reveals no reason for their selection as problems.

A comparison of the hobbies of these four groups reveals some significant differences (Table 7). Three reading interests are listed—fiction, history and science, and funny papers. The most universal reading interest is the funny paper. There is little difference between the groups relative to reading the funny paper, excepting the retarded group which is significantly less interested in all types of reading. It is interesting to note that the genius children are more interested in reading fiction than the funny paper. The superiority of the genius group relative to the first two types of reading interests, fiction, and history and science, is statistically significant on the basis of all comparisons. Otherwise the differences are such as would be expected in terms of respective mental levels (2, pp. 49-50; 3, pp. 80-81).

The genius group does not appear to such an advantage in the case of active and quiet games. The only comparison on which they definitely fall below the normative group is on the girls' interest in active games. The boys of this group manifest a significantly greater interest in quiet games. Otherwise the differences probably are due to differences in intelligence and age.

Boys and girls of the genius group are rated as having interests which are sufficiently greater than those of the normative group to be statistically reliable on playing musical instruments, studying, scouting, and collecting. Other important differences favoring the genius group which are not large enough to be reliable, due to a paucity of cases since no hobbies were checked for many of the children, are in dramatics, traveling, going to shows, playing make believe, and listening to the radio. It is quite possible that, in the case of attendance at shows and traveling, the superior economic status of the families of the genius group is an important factor. The other differences, undoubtedly, are in part a function of the superior intelligence of the genius group but they are more than that since they tend to exceed the interests of the upper 10 per cent of the group under consideration (2, pp. 51-2).

The boys of the genius group are more interested in sewing, housework, and religious activities than those of the other three groups, but the girls of this group are comparatively less interested in sewing and housework. They also attend shows and participate in club and social activities less. Both boys and girls of this group are decidedly less interested in working, such as in stores, on the farm, and the like than any of the other three

TABLE 7
THE PERCENTAGES OF THE NORMATIVE, RETARDED, PROBLEM AND GENIUS GROUPS WHO WERE DESIGNATED AS INTERESTED IN THE VARIOUS HOBBIES BY SEX

Hobbies	Normative	Retarded	Problem	Genius
	Boys			
1. Reading—novels	36.2	20.8	29.7	53.2
2. Reading—history, science	16.7	11.2	15.6	37.3
3. Reading—funny papers	46.0	40.6	47.6	50.6
4. Active games	58.7	56.5	66.8	60.6
5. Quiet games	22.4	19.3	23.7	38.6
6. Playing musical instruments	14.7	10.0	14.8	30.0
7. Listening to radio	30.0	28.7	32.9	43.3
8. Sewing	1.8	2.3	3.1	4.0
9. Housework	6.7	7.0	8.0	10.0
10. Going to shows	33.0	31.7	38.0	36.0
11. Dramatics	5.3	3.2	5.8	9.3
12. Playing make believe	9.2	6.1	8.9	17.3
13. Religious activity	14.0	11.0	12.1	20.6
14. Building things	34.0	27.5	32.0	34.0
15. Traveling	10.2	7.8	9.6	13.3
16. Driving cars	9.9	10.4	9.8	4.7
17. Studying	5.6	4.0	4.6	20.0
18. Working—store, farm, etc.	16.4	17.6	19.0	12.6
19. Clubs, socials, etc.	2.7	2.2	3.5	3.3
20. Scouting	10.0	6.7	8.9	12.0
21. Collecting	17.2	10.3	16.7	26.0
22. None	8.2	12.3	*	.7
Cases	5,166	2,138	1,468	160
	Girls			
1. Reading—novels	49.6	27.7	36.0	59.3
2. Reading—history, science	15.1	8.9	14.2	27.7
3. Reading—funny papers	48.5	39.0	49.5	48.6
4. Active games	47.9	35.0	41.0	36.8
5. Quiet games	28.1	24.0	33.3	30.0
6. Playing musical instruments	22.0	11.4	17.0	39.6
7. Listening to radio	36.7	31.7	38.0	38.5
8. Sewing	37.8	36.6	35.1	32.8
9. Housework	37.7	40.5	38.2	28.8
10. Going to shows	33.8	27.5	33.7	30.5
11. Dramatics	12.1	6.1	10.5	16.4
12. Playing make believe	23.2	23.7	25.9	27.7
13. Religious activity	20.4	16.2	17.7	20.9
14. Building things	4.2	3.7	5.4	4.4
15. Traveling	10.6	7.3	8.3	16.4
16. Driving cars	4.1	3.7	5.8	5.1
17. Studying	8.6	5.9	6.1	11.9
18. Working	5.5	6.1	6.8	4.5
19. Clubs, socials etc.	8.5	5.8	8.3	6.2
20. Scouting	9.6	3.5	6.3	8.5
21. Collecting	17.7	9.2	10.8	25.4
22. None	6.6	12.1	*	1.1
Cases	5,059	1,221	445	177

*These data are not available.

groups. It is significant to note that only about one per cent of the genius children are listed as having no hobbies whereas far larger percentages of the normative and retarded groups are so listed. No such information is available relative to the problem group.

The group designated by teachers as retarded have relatively few hobbies. Their interest in only five hobbies is equal to, or superior to those of at least two other groups. These are driving cars and working, for the boys, and sewing, housework, and playing make-believe, for the girls. The latter interest is probably indicative of their relative immaturity since, in spite of the fact that they are older, they are clinging to an interest that declines rapidly during this period. All the differences referred to above are small and unreliable mathematically. It seems probable that the relative paucity of interest of children selected as retarded may be partly responsible for their selection.

The problem group was rated as having superior interests in a few hobbies but the only ones in which their superiority to all groups is great enough to possess statistical reliability is the boys' interests in active games. The boys of this group also have a statistically reliable greater interest in going to shows, except when compared with the genius group. They manifest a greater interest in working, as in stores, on the farm and the like, and in clubs and socials. The interests of the problem boys exceed those of the normative and retarded groups, although not of the genius group, in reading the funny papers, quiet games, playing musical instruments, listening to the radio, sewing, house work, and dramatics. The problem girls rank first, although the superiority is not great enough to yield reliability, in reading the funny papers, building things, driving cars, and working, as in stores or on the farm. They also are superior to all except the genius group in listening to the radio and to all except the retarded group in housework.

The retarded group are backward in practically all interests as revealed by their hobbies. No doubt the absence of these interests played some part in their selection as retarded. There is some evidence that the problem children incline as a group to activity, but activity that tends to be non-intellectual. This conclusion is based on their interest in games, housework, going to shows, driving cars, working, and clubs and socials. These interests are not such as would make for a successful school adjustment. On the other hand, those selected as geniuses manifest a superior interest in those hobbies that are intellectual and academic in nature and that make for successful adjustment in school. Specifically, these interests are reading fiction, history, science and biography, playing musical instruments, listening to the radio, dramatics, traveling, studying, scouting, and collecting.

EDUCATIONAL ACHIEVEMENT

A factor which might be expected to enter into the selection of two of the groups under consideration in this study, that is, the retarded and genius groups, is educational achievement. This type of achievement was measured by the standardized battery known as Unit Scales of Attainment. This battery is composed of 11 individual subject matter tests but only four of these were selected for detailed analysis, reading, geography, arithmetic problems, and language usage. It was assumed that these four would give a cross-section of the scholastic achievement of the pupils involved. The raw scores on the achievement tests were converted into *C*-scores according to directions given in the manual which accompanies these tests, and the *C*-scores were used in making all comparisons in respect to academic achievement.

Comparisons of median mental ages reveal no particular retardation, certainly no "extreme mental retardation," on the part of the retarded group. As a matter of fact, their median mental ages exceed those of the lower 10 per cent at every grade level and for both sexes. These differences in median mental ages run from .26 to .69 years, for an average of .44 years, for the boys, and from .15 to .53 years, for an average of .30 years, for the girls. They are retarded in comparison with the normative group, the differences running from .88 to 1.18 years, for the boys, and from 1.17 to 1.38 years, for the girls. Comparisons between the lower 10 per cent and the retarded group on median mental ages are more significant for determining whether they are retarded as far as mental development is concerned. On this score, it appears that the teachers were not particularly efficient in their selection of retarded children.

Retardation might mean retardation in school achievement. In fact, it would seem that it would have to mean this since teachers, without benefit of standardized intelligence tests, would have no other criterion of retardation. There is little difference in the median achievement scores of the lower 10 per cent and the retarded group although the scores of the latter group tend to be slightly above those of the former. While the retarded group is decidedly below the normative group in achievement their retardation as compared with those who are really mentally retarded, the lower 10 per cent, is not striking.

A comparison of achievement relative to mental ability was attempted. The quartile deviation of the median mental ages and the quartile deviation of the median achievement test scores were determined. These were compared to determine whether the median achievement scores exceed or fall below the quartile deviations of the median mental ages. It is assumed that, if a group is working up to capacity, the quartile deviation of the median achievement score will equal that of the median mental age. When the quartile deviation of the median achievement score is greater than that of the median mental age, it is assumed that the group is working below capacity, if the deviation is negative, or above expectation, if the deviation is positive. On the other hand, when the quartile deviation of the median achievement score is less than that of the mental age median, it is assumed that the group is working superior to capacity, if the deviation is negative, and working below capacity, if the deviation is positive.

When the achievement of the retarded group is looked at from this point of view it is found that, while the retarded group is achieving above expectation, its acceleration relative to ability is less than that of the lower 10 per cent. The picture is not clear-cut and the over-all picture is not one of great retardation, particularly when they are compared with the lowest group in measured mental ability. It must be held in mind that the picture is intended to be one of extreme mental retardation.

The problem group appears to be achieving about what would be expected of them in terms of measured ability so that it would appear that they are not problems as far as achievement is concerned. This is in line with the findings of most studies.

Educational achievement appears to be a factor in the selection of the genius group. Their median mental age is slightly below that of the upper 10 per cent, their average chronological age is below that of the other three groups, yet their median achievement test scores tend to exceed those of the upper 10 per cent as well as those of the other groups. They are achieving more in terms of ability than the upper 10 per cent of this population. This suggests that the academic achievement of these children played a part in their selection.

FAMILY BACKGROUND OF THE SELECTED GROUPS

Home conditions play a rôle in the adjustment of the child. Some information is available relative to the homes from which the various selected groups under consideration in this study come. The data deal only with factors which are relatively tangible and, consequently, most susceptible of measurement. It must be realized that such things are not crucial to the adjustment of the child and are only important in so far as they are closely related to the more crucial factors such as attitudes which are intangible and, as yet, very difficult to measure.

The occupations of the fathers were classified according to the Terman-Taussig classification (6, p. 64) This classification lists the occupations under five headings: (*a*) professional, (*b*) semi-professional, or business, (*c*) skilled labor, (*d*) semi-skilled or slightly skilled labor, and (*e*) common labor. The comparisons in Table 8 do not disclose any factors which might enter into the selection of the various groups. The distributions of the fathers' occupations differ, at the most, only slightly from what would be expected. The genius group differs only slightly from the upper 10 per cent. They may be slightly above expectation but the differences are too small to be significant. The retarded group differs only slightly from the lower 10 per cent and this difference, while not significant, is in the direction to be expected since their median *IQ* is slightly higher than that of the lower 10 per cent. The problem group tends more toward the higher classifications than the lower 10 per cent but less so than the normative group. This is in line with the median *IQ*'s of these groups.

TABLE 8
THE PERCENTAGE OF THE FATHERS OF THE NORMATIVE AND SELECTED GROUPS, TOGETHER WITH THOSE OF THE UPPER AND LOWER TEN PER CENT WHO ARE ENGAGED IN EACH TYPE OF OCCUPATION

Occupational classification	Norm	Upper 10%	Genius	Lower 10%	Retarded	Problem
1	4.3	10.3	10.3	.6	.9	2.9
2	21.6	35.9	37.2	10.9	12.6	15.4
3	41.9	37.4	36.1	41.6	44.4	46.0
4	12.9	10.3	9.1	15.6	14.3	17.5
5	19.2	5.9	7.3	28.9	28.1	18.2
Cases	12,390	4,289	341	3,697	2,743	1,492

A socio-economic rating schedule was used which took into account the father's occupation, the presence of a telephone, auto, radio, regular servant, or newspaper in the home, and the room-per-person ratio. The median scores of the groups on this basis are: normative, 6.5; genius, 8.3; retarded, 4.9; and problems, 6.1—the range being 0 to 18. These merely substantiate the findings noted above relative to the father's occupation.

Much has been made, on occasion, of the importance of the birth order of the child, particularly as regards problem behavior. The findings of this study are mostly negative. The birth order of the problem children is not significant since they tend to follow expectations relative to the average mental ability of the group. McGehee (3, p. 93) has pointed out that children of low intelligence tend to come from larger families, and Lewis (2, p. 76) has pointed out that superior children tend to come from smaller families. It is to be expected that genius children tend to fall in lower birth orders since they come from smaller families. There do tend to be more only children and first children than would be expected when they are compared with the upper 10 per cent. The size of the genius group is too small, however, for the differences to be reliable. There are a few more only children in the problem group than would be expected but the differences are so slight that there is no justification, on the basis of this data, for holding that only children tend to be problem children. There appears to be nothing in the data relative to the family background of the selected groups which would reveal reasons for their selection.

Conclusions

The fundamental purpose of this study has been to determine the distinction which elementary school teachers tend to make between those of their pupils whom they believe to be either extremely retarded mentally, problems, or geniuses. The *BPC* Personal Inventory and factors in the home background such as fathers' occupations, socio-economic status, and birth-order in family, do not reveal any factors which functioned in the selection of the three groups.

The teachers selected 7 per cent of their pupils as being "extremely retarded mentally." The fact that it is not easy for teachers to select those of their pupils who are in this class is revealed by the results of the Kuhlmann-Anderson Tests which showed their median *IQ* to be slightly over 90.

The picture obtained of this group is largely negative. The desirable traits appear to be less characteristic of them than of any group. This is very definitely true when comparison is made with the normative and genius groups. In general, the teachers find them lacking the positive characteristics of the genius group and normative group and lacking to an appreciable degree the aggressive traits which express themselves in overt, undesirable behavior that characterize the problem group. They have few interests, particularly those that are intellectual and academic in nature.

The teachers' conception of problem children is quite different. They selected 4.4 per cent of their pupils as problems, the boys outnumbering the girls three to one. They represent a wide range of mental ability and are not educational problems, at least not in terms of scores obtained on achievement tests. The teachers find them lacking in desirable personality traits except for certain traits which suggest aggressive personalities. The traits, however, which are found to be most characteristic of this group are undesirable traits which would prove very annoying to the teacher. It is quite evident that the teachers' conception of a problem child is one who upsets the classroom routine, who is aggressive and disturbing.

The evidence indicates that the genius group was selected because of their ability to adjust to the classroom situation, because of their interests which tend to be intellectual and academic, because of their highly desirable personalities and their academic achievement. Teachers evidently believe that the term genius should be applied only to very exceptional children since they selected only .74 per cent of their pupils as geniuses.

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A STUDY OF THE FRIENDSHIP FLUCTUATIONS OF URBAN BOYS AND GIRLS*

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A. INTRODUCTION

In a previous study (4) the writers investigated the degree of friendship fluctuation among 421 adolescent boys and 484 adolescent girls living in rural areas. In that investigation it was shown that in a population of rural youth, ranging in age from 10 to 17 years, there is, over a two-week period, an increase in the stability of friendships with increasing chronological age. It was also demonstrated that rural boys and girls do not differ significantly in friendship fluctuation at any of the age levels from 10 to 17 years. Furthermore, the data did not support the hypothesis advanced by Hall (3), Allport (1), and Benedict (2), that adolescence is a period of marked emotional upheaval—of "storm and stress." There was no indication of an upswing in friendship vacillation among rural youth during the onset and initial phases of adolescence.

Some preliminary data, available when the report on rural youth was prepared for publication, indicated that there might be a difference in the friendship stability of rural and urban adolescents. Because of the interesting cultural implications of such a difference, if it were substantiated by a large body of data, the writers felt that the problem merited further research and study.

The purpose of the present study was to investigate the degree of friendship fluctuation among adolescent boys and girls living in urban areas, and to compare the degree of friendship fluctuation of urban youth with that of rural youth.

B. SUBJECTS

The 969 subjects for this study were obtained from two cities in New York State and one city in Pennsylvania. Children from grades six to 12 were asked to coöperate in this experiment. An attempt was made to select schools within these three cities that enrolled pupils who came from families of approximately average socio-economic status.

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TABLE 1

Chronological age	Number of girls	Number of boys	Total boys and girls
11	16	21	37
12	67	47	114
13	93	91	184
14	64	50	114
15	88	88	176
16	98	67	165
17	82	64	146
18	25	8	33
Total	533	436	969

Table 1 presents the numbers of girls and boys at the various chronological-age levels who were employed in this study. The age range of these subjects extends from 11 to 18. The subjects available at years 11 and 18 are inadequate in number and probably selected with respect to intelligence; however, they have been retained in the analysis with this reservation in mind. Extensive data have been collected over the age range of 12 to 17. Since girls become pubescent at about 13 to 13½ years and boys about two years later, the periods of pre-pubescence, pubescence, and post-pubescence are fairly well represented in this body of data.

C. PROCEDURE

All of the children selected for this study were given a slip of paper upon which the following request was mimeographed:

> Please write below the names of your three best friends, or the people you like best in your classroom. List the one you like best, first; second best, second; and third best, third.

Three numbered lines were provided for the subjects to write down the names of their three best friends. The teacher in each homeroom explained verbally what the pupils were to do, stressing that the best friend's name was to be placed first and that friends outside the school were not to be named.

Two weeks later the children were again requested to list their three best friends in order of preference. Mimeographed slips were distributed which presented the same directions used on the first slip with the following addition:

> The people you listed may or may not be the ones you liked two weeks ago. Be sure to write down the ones you like best now.

Nine hundred and sixty-nine children consisting of 436 boys and 533 girls participated in this experiment.

D. RESULTS

Friendships among urban youth, as measured by the instruments employed in this study, ranged over a two-week period from complete constancy to complete inconstancy. The responses of the majority of the subjects were, however, between these two extremes in friendship fluctuation. To measure these rather complex changes in friendship it seemed desirable to obtain some type of an over-all index of friendship fluctuation.

To provide a comprehensive measure of friendship fluctuation the following analytic procedure was adopted (this same type of analysis was used in the study of rural youth):

> The three friends chosen by each subject during the second choice situation were compared with the three friends chosen two weeks previously.
>
> If the friends chosen the second time duplicated in personage and rank order the friends chosen two weeks previously, the index of friendship fluctuation was considered to be zero.
>
> If the friends chosen the second time duplicated in personage but differed in rank order from the friends chosen two weeks previously, an index of friendship fluctuation was computed by assigning a numerical value of one to each rank that a friend of the second choice situation was separated from the rank initially assigned to him; e.g., if the original ranking were: like best, John; second best, Bill; third best, Carl; and the second ranking were: like best, Carl; second best, John; third best, Bill; the fluctuation index as computed by this procedure would be four; since Carl is removed two ranks, Bill one rank, and John one rank from the original rankings.
>
> If a subject during the second choice situations chose among his three best friends boys or girls whom he had not previously chosen, the following numerical values were assigned to these *new* friends; two for a person not previously mentioned who became the subject's third-best friend during the second choice situation, three for a person not previously mentioned who became the subject's second-best friend, and four for a person not previously mentioned who became the subject's best friend.
>
> The following example may help to clarify the procedure employed to obtain this over-all index of friendship fluctuation.

Subject *X*, female, age 13

	First choice situation	Second choice situation (Two weeks later)
Best friend	Janet Blair	Janet Blair
Second-best friend	Nora Collins	Mary Coleman
Third-best friend	Mary Coleman	Alice White

Friendship Fluctuation Index: 3.

The numerical values assigned to these changes in friendship over a two-week period were, of course, arbitrary; since outside criteria of friendship fluctuation from which one could determine appropriate weightings were not available. Although the numerical values assigned in this study to the various changes in friendship were determined on a rational rather than an empirical basis, the writers, nevertheless, believe that this type of analysis provides suitable data for a crude over-all index of friendship fluctuation. The possible loss in precision with this type of analysis is, perhaps, more than compensated for by the fact that this analytic procedure enables one to evaluate *simultaneously* all of the complex data on friendship changes.

Indices of Friendship Fluctuation

The means and standard deviations of the distributions of friendship fluctuation for the various chronological-age levels are presented in Table 2. These results are based on an analysis of the responses of 533 urban girls and 436 urban boys. In this table are also presented the results of statistical comparisons of the distributions of friendship fluctuation of boys and girls at the various age levels.

TABLE 2
SEX DIFFERENCES IN INDICES OF FRIENDSHIP FLUCTUATION

Chronological age	Girls Mean	Girls *SD*	Boys Mean	Boys *SD*	*t*
11	4.19	2.85	3.48	2.15	0.81
12	3.21	2.46	3.45	2.62	0.48
13	3.83	2.57	3.23	2.68	1.52
14	3.58	2.46	3.66	2.75	0.16
15	3.32	2.71	3.44	3.06	0.28
16	2.31	2.53	3.13	2.78	1.92
17	2.15	2.43	2.14	2.56	0.01
18	1.60	2.67	2.25	1.92	0.71

The magnitude of the standard deviations for both sexes demonstrates that there are large individual differences in the stability of friendships at all of the chronological-age levels studied. This variability of individual responses further indicates that the measuring instrument is sufficiently sensitive to detect differences between the sexes as well as between the various age groups if such differences exist.

The *t*'s obtained in the statistical analyses indicate that the small differences in friendship fluctuation between the boys and girls at each of the chronological-age levels can reasonably be attributed to random errors of sampling. From these statistical analyses one cannot reject with a reasonable degree of confidence[1] the null hypothesis that there are no differences in friendship fluctuation between the boys and girls at the various age levels included in this study. It may be seen that the *t*'s at the 13- and 16-year-levels are the only ones that even approach statistical significance. At the 13-year-old level the mean fluctuation index of the girls is higher than that of the boys, but the null hypothesis can be rejected at only the 14 per cent level of confidence. At the 16-year-old level the mean fluctuation index of the boys is higher than that of the girls, but the null hypothesis can be rejected at only the 7 per cent level of confidence. On the basis of these data it might be concluded on a tentative basis that an increase in friendship fluctuation accompanies the onset of pubescence; since the girls appear to show more friendship fluctuation than the boys at year 13 when about 70 per cent of the girls are pubescent, and the boys appear to show more fluctuation than the girls at year 16 when about 90 per cent of the boys are pubescent. However, even such a tentative conclusion becomes very tenuous when one considers that these sex differences cannot be accepted as reliable at a very high level of confidence. The negative results on sex differences in friendship fluctuation among rural youth (4) also casts doubt on such a conclusion. With the data at hand on 905 rural subjects and 969 urban subjects, one is led to conclude that there are no reliable sex differences in friendship fluctuation at the various age levels studied.

Since the distributions of friendship fluctuation of the boys and the girls were not found to be significantly different at the various age levels, it seemed desirable to combine the data of both sexes into a composite of urban youth. This combination of data for boys and girls was also made in the earlier study on rural youth.

The means and standard deviations of the distributions of friendship fluctuation for urban youth at the various age levels are presented in Table 3.

TABLE 3
BOY-GIRL COMPOSITE INDICES OF FRIENDSHIP FLUCTUATION

Chronological age	*N*	Mean	*SD*
11	37	3.78	2.50
12	114	3.31	2.53
13	184	3.53	2.64
14	114	3.61	2.59
15	176	3.38	2.89
16	165	2.64	2.66
17	146	2.14	2.49
18	33	1.76	2.52

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[1] At either the one or the five per cent levels of confidence as determined by the *t*-test (5).

The means of the friendship fluctuation indices for this boy-girl composite population are also presented graphically in Figure 1. The combined data of these 969 urban boys and girls show a consistent downward trend in friendship fluctuation from year fourteen to year eighteen. The results of statistical analyses comparing the fluctuation index of each chronological-age group with that of every other age group are presented in Table 4. The obtained *t*'s indicate that the mean fluctuation indices of the 16-, 17- and 18-year-old groups are significantly lower than the mean fluctuation indices of the 11-, 12-, 13-, 14-, and 15-year-old groups.

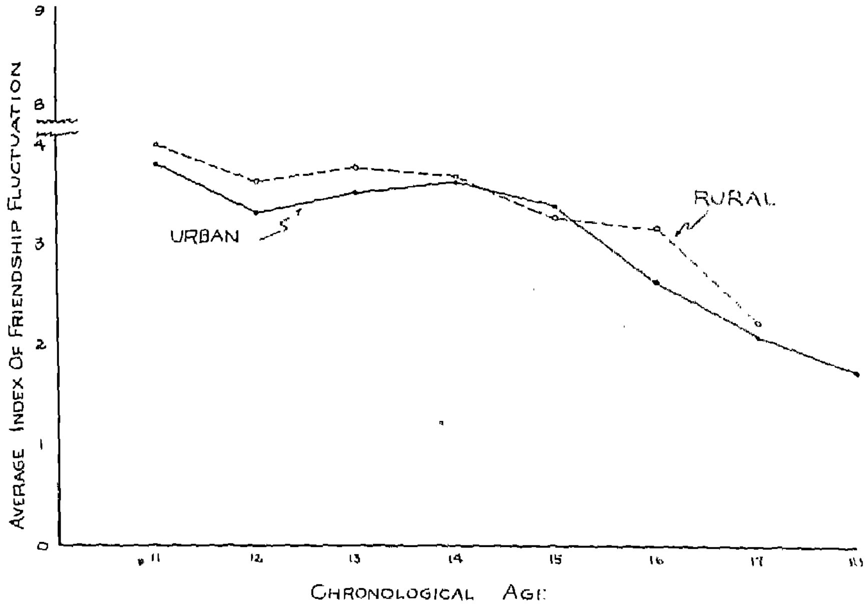

FIGURE 1
The solid line indicates the relationship between chronological age and friendship fluctuation for an urban population of 969 boys and girls. The dashed line represents the friendship-fluctuation data of a previous study of 905 rural boys and girls.

In summary, this type of analysis indicates that there is a significant trend toward greater stability in the friendships of urban adolescents with increasing chronological age. The data on friendships among rural adolescents, reported in an earlier publication, also supports this conclusion. Both of these studies on the friendships of urban and rural adolescents fail to show any upswing in friendship vacillation during the onset and initial phases of adolescence. The inconsistent, mercurial characteristics frequently attributed to adolescents' behavior are not reflected in the relative stability of their

TABLE 4

RESULTS OF STATISTICAL COMPARISONS OF THE DISTRIBUTIONS OF FRIENDSHIP-FLUCTUATION INDICES OF THE EIGHT CHRONOLOGICAL-AGE GROUPS*

							Chronological age
						_0.79_ (177)	17
					_1.72_ (309)	_1.81_ (196)	16
				_2.46_* (339)	_4.12_** (320)	_3.31_** (207)	15
			_0.71_ (288)	_3.03_** (277)	_4.59_** (258)	_3.64_** (145)	14
		_0.26_ (296)	_0.52_ (358)	_3.07_** (347)	_4.78_** (328)	_3.70_** (215)	13
	_0.73_ (296)	_0.90_ (226)	_0.23_ (288)	_2.07_* (277)	_3.63_** (258)	_3.09_** (145)	12
_1.01_ (149)	_0.54_ (219)	_0.35_ (149)	_0.86_ (211)	_2.48_* (200)	_3.56_** (181)	_3.32_** (68)	11
12	13	14	15	16	17	18	

Chronological age

*In the above table the italicized numbers are the _t_'s for the various chronological-age group comparisons. The numbers in the parentheses represent the numbers of degrees of freedom for the various _t_ values. Those _t_ values statistically significant at the 5 per cent level of confidence are indicated by a single asterisk; while those significant at the 1 per cent level of confidence are designated by two asterisks.

friendships as compared with pre-and post-adolescents. This conclusion is based on a study of 1,874 boys and girls, since both the urban and rural adolescents fail to show an increase in friendship fluctuation when compared with pre- and post-adolescents.

To ascertain what happened to best friends over a two-week period, a further analysis of the data was made. The results of this analysis are presented in Figure 2. From year 11 to year 14 a little over 50 per cent of the boys and the girls named the same person as their best friend in both choice situations. From year 15 to year 18, 60 to 90 per cent of the boys and girls named the same person as their best friend in both choice situations. As was found in the data on rural adolescents, these data on urban adolescents indicate a greater tendency for girls than for boys to select the same person as their best friend in choice situations separated by a two-week interval.

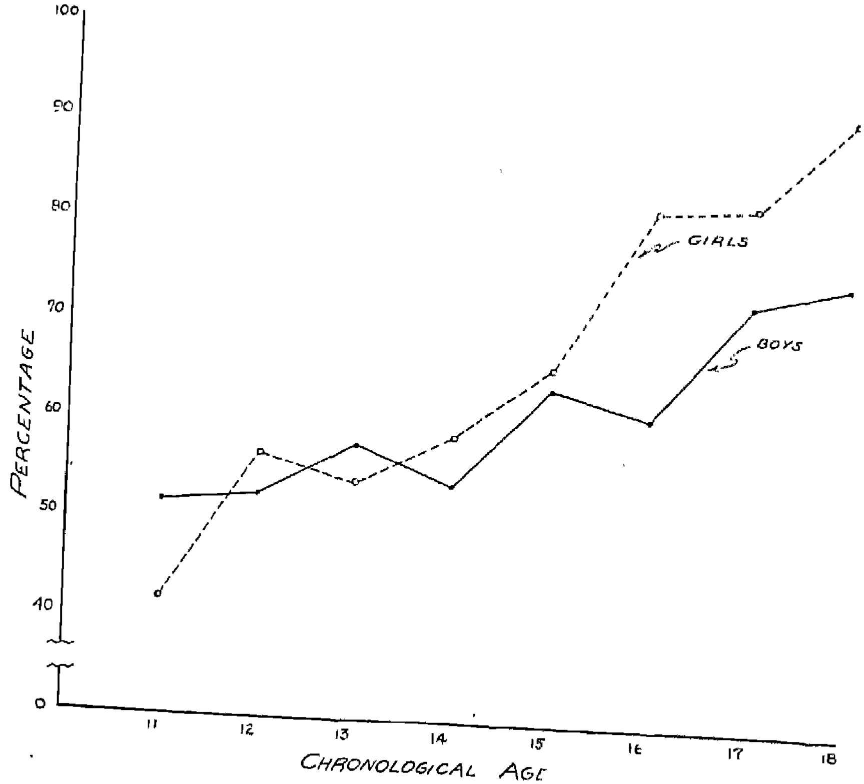

FIGURE 2

Figure 2 shows the relationship between chronological age and percentages of boys and girls choosing the same person as their best friend (first choice) on two occasions separated by a two-week interval.

Urban-Rural Comparisons

Since the experimental techniques and procedures employed in this study of the friendship fluctuations of urban adolescents are the same as those used in the earlier study of rural adolescents, it is possible to compare the friendship stability of rural and urban adolescents at the various age levels included in these two studies. The dashed line in Figure 1 indicates the means of the friendship-fluctuation indices for the rural population, as determined in a previous study. It can be seen that the results obtained with the urban population are quite similar to those previously secured with the rural population. Statistical analyses of these urban-rural comparisons provide the following *t* values:

CA	11	12	13	14	15	16	17
t	0.47	0.91	0.82	0.17	0.32	1.60	0.31

Although none of these *t* values is sufficiently large to reject the null hypothesis at either the one or the five per cent level of confidence, there does appear to be some tendency for the rural adolescents to be less stable in their friendships, since six of the seven means of friendship fluctuation are greater for the rural adolescents than for the urban adolescents. However, these differences between urban and rural adolescents in friendship fluctuation are small in magnitude. Both the rural and urban youth demonstrate greater stability of friendship with increasing chronological age.

E. Discussion

From the data of the present study, and the data of the previous study of rural youth, one must conclude that adolescents demonstrate approximately the same degree of stability in their friendships as do pre-adolescents. Moreover, these data indicate that stability of friendship during the adolescent years is an increasing function of chronological age.

As pointed out in a previous report (4), the present research is not a crucial test of the *"Sturm und Drang"* hypothesis of adolescent development since it is conceivable that adolescents might demonstrate a relatively high degree of stability in this rather narrow area of social development and evidence great instability in many of the other areas of social, emotional, and intellectual development. However, the present findings, along with the negative findings of other investigators, tend to discredit this assumption—which has been based, largely, on chance observations and arm-chair theorizing—that adolescents' behavior is extremely erratic and unstable.

From the analysis of the data on best friends, there appears to be considerable fluctuation in friendship among urban adolescents at all of the age levels studied. However, as pointed out in the study of rural youth, the degree of fluctuation of friendships is probably emphasized by the nature of the research procedure. It is possible that boys and girls during the adolescent years may have a reservoir of many friends who are almost equally well liked. When asked to name three of his best friends, an adolescent may have extreme difficulty in selecting only three from this reservoir of friends. On what bases can a subject select only three friends from several who are almost equally preferred? It seems reasonable that recent contacts, minor disagreements, and more or less chance factors might influence his selections during the two choice situations and thus indicate a spuriously large amount of fluctuation in friendship over a two-week period.

Since adolescents' friendships become more stable as they become older, it would appear that one of the characteristics of the mature person is his ability to maintain relatively permanent friendships with his associates. This conclusion agrees with a more casual type of observation that adults who discard or reject friends on slight provocation are likely to be individuals who also demonstrate other types of immature or "childish" behavior. The present experimental evidence verifies this hypothesis frequently advanced in textbooks on adolescent psychology.

From the available data it is not possible to explain the urban youth's slightly greater stability of friendships as compared with the rural youth. The rural youth may evidence more friendship fluctuation because they are more isolated, and thus do not have an opportunity to develop such strong friendships. This is, however, merely a conjecture.

F. SUMMARY

The purpose of this study was to investigate the degree of friendship fluctuation among adolescent boys and girls living in urban areas, and to compare the degree of friendship fluctuation of urban youth with that of rural youth as determined in a previous study. Nine hundred and sixty-nine urban youth consisting of 436 boys and 533 girls participated in this study. The subjects were asked to list their three best friends on two occasions, 14 days apart. An analysis which included an index of friendship fluctuation was made of their responses.

In this urban youth population, there is a trend toward greater stability in friendship with increasing chronological age. These data do not show any upswing in friendship fluctuation at, and following, the initial phases of adolescence, as might be expected on the basis of the "storm and stress" hypothesis of adolescent adjustment.

The urban adolescents of this investigation demonstrate a slightly greater stability in their friendships than the rural adolescents studied in a previous experiment.

These data indicate that one of the characteristics of the mature person is the ability to maintain relatively more stable friendships than the immature or "childish" individual.

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FACTORS ASSOCIATED WITH CHILDREN'S TAKING MUSIC LESSONS, INCLUDING SOME PARENT-CHILD RELATIONSHIPS: I. HISTORY AND PROCEDURES* †

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A. INTRODUCTION AND PROBLEM

There are various means which may be used by the individual in his attempt to gain a desired status in a group. Some of these which are readily observed are: social skill, scholastic attainments, athletic achievement, musical performances, proficiency in the fine arts. Does the child gain direct satisfaction from the activity itself; or is he carrying out a parental dictum? Such questions as these may have profound significance to those who endeavor to understand and guide children.

The problem which the experimenter has set herself is: To study the factors which are associated with a child's taking music lessons, what satisfactions he gains, and what part parental attitudes may play in the picture.

It appears that some such issues as these might exist in the situation: (*a*) the child might gain satisfaction in musical performance because of native ability and a real pleasure in music; (*b*) he might excel to offset a feeling of insecurity in other areas; (*c*) parental attitudes toward studying music might be a genuine interest in helping the child develop a real ability; or (*d*) parental attitudes might be the results of the parents' striving for

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[1] The author wishes to acknowledge her deep appreciation for the inspiration and guidance of her Major Professor, Dr. Harriet E. O'Shea. As a result this study has been more than just a thesis, it has been rather a major project in both intellectual and personality growth on the part of the author. The members of the Committee: Professor H. H. Remmers and Professor C. L. Morgan as well as Dr. Ida B. Kelley, have been helpful by sharing ideas and equipment. Professor I. W. Burr has rendered valuable assistance in statistical procedures. To all these busy persons the author expresses her thanks. M. W. Howenstein and Ruth Jamieson were of inestimable help in the selection of subjects for this experiment. Without their interest and suggestions the project would have suffered. Thanks are due to school officials and teachers and to the persons who acted as judges in various capacities during the study. The author wishes to express her gratitude to her husband, Dr. Gordon H. Graves, for his deep interest, his patient cooperation and support during the entire undertaking.

social status through the success of the child (it may be "stylish" to take music lessons); or (*c*) there may be unfulfilled parental ambition projected upon the child.

Music was chosen as the area for study for several reasons. It is an appealing and significant type of human experience and behavior. Musical ability seems susceptible to measurement by isolating certain simple factors. In the community in which this study was made, taking music lessons loomed large in the social patterns. In fact, it was discovered that giving music lessons is in the nature of a flourishing industry, so much so that it was difficult to find control subjects who did not, at the time, take music lessons or who had never taken lessons.

Some of the questions which arise about children who excel in music center around their play activities. In order to become a good performer on a musical instrument a child needs to devote some of his otherwise free time to practicing and rehearsing. As a consequence, or for other reasons, do these musical children, as a group, participate less in play and sports than children who do not study music? Is their play more or less active than that of non-musical children? Do the two groups, on the whole, show any difference in the amount of social participation in their play?

Other interesting questions upon which the data may throw some light are: Do the children who study music and the ones who do not differ: (*a*) in ratings on music tests; (*b*) in social acceptance by their group; (*c*) in attitudes toward performance in music, toward practicing and the like; and (*d*) in the amount of emotional conflict present? Do the parents of the two groups differ appreciably: (*a*) in their estimate of the social value of music lessons; (*b*) in their attitudes toward the importance of music performance; (*c*) or in their own childhood and present experience and interest in music? These and similar questions will be studied in the present experiment.

B. History of the Literature

A careful survey of the studies in this general field disclosed none, so far as the author could determine, which examined just the type of question studied here. Some of the tests used in this experiment have been given separately, for example the music tests, to measure one aspect of the problem. But no studies were found which attempt to measure parent-child relationships, for instance, as related to musical performance.

According to Zachry (29) adolescents are confronted with the question of personal worth. A child may be impelled to go to some lengths in the effort to establish self-assurance and to find satisfying means of self realization. Every day he either achieves success or falls short in the light of his standards. The desire to achieve in order to demonstrate his own worth is a healthy stimulus if he is emotionally secure.

> Some adolescents are overanxious to prove themselves through proficiency. Usually, they hope to gain affection by the circuitous route, or at least to find in attention a measure of compensation for warmth in human relationships which they miss. Especially if parents have urged their child unduly into the learning of skills for which he was emotionally unprepared, he is likely (as has been indicated) in adolescence to overemphasize the value of achieving.
>
> Since this mode of response is compatible with the academic goals held in many schools, it usually fails to be recognized as an indication of emotional difficulty. In fact, it is likely to be fostered by the teacher's attitude.
>
> Sometimes an adolescent strives to attain outstanding success in a single field of achievement in order to compensate for inadequacy in another area. . . . A tendency toward due compensation for shortcomings through achievement is helpful to the adolescent in his development when it is accompanied by efforts to make up the deficiencies themselves (29, p. 179).

Zachry's keen interpretation of the adolescent's emotional problems is especially pertinent at this point. The subjects for this present study were selected largely from young adolescent groups, 72 per cent of the subjects being from Junior High School and High School classes.

Fitz-Simons (8), in her notable contribution in the field of parent-child relationships, constructed a Guide for the estimation of parental attitudes. The Guide is a 9-point scale ranging from 4+ through 0 to 4—, according to the degree of attachment of parent to child, with 0 for those statements which give no indication of emotional tie between parent and child. There are 46 items describing types of parental behavior. The 4+ rating shows a high degree of acceptance of the child by the parent and 4— extreme rejection. Twelve Key Points, scored either + or —, refer more directly to the parent's feeling for the child. The Key Points help to identify the over-protective attitude which is really concealed rejection.

> The term "relationship" is broader than attitude because it includes the parent's attitude toward the child, the child's attitude toward the parent, and the action and reaction of each to the other. It points to the interaction between parent and child and indicates the double direction of influence which affect the relationship. The parent's behavior is here used as an indication of the parent's attitude toward the child and the emphasis is on the parent side of the relationship, so the direction is one-way, toward the child (8, p. 19).

The important objective in this type of research "is the knowledge of the effect of different parental attitudes upon the child's personality development, the significant factor is the effect, not the cause of the parent's behavior toward the child" (8, p. 19).

Fitz-Simons discovered an important point in the study of her data. In the case-studies which she used the attitudes and behaviors of both fathers and mothers were given. If the mothers alone had been used, and those of two groups showing negative attitudes had been studied together, the differences in the behavior problems of the children would not have been evident.

> This points out the danger of basing conclusions on studies of children's behavior in relation to the behavior or attitude of one parent only. In most of the research on parental attitudes and children's problems the emphasis is on the mother-child relationship. Even though the father is not usually with the child as much as the mother, his influence is significant (8, p. 107).

Fitz-Simons states that it can happen that the parent "is identifying himself with the child to such an extent that in indulging the child he is virtually giving himself the pleasures which he would have wished for and did not have as a child. Music lessons and other educational advantages which are given children because of such an identification are often given in spite of the fact that they are not only not desired by the child but actually disliked" (8, p. 120).

One source of experiences for happy purposeful learning of children is found in music. Mursell (18) believes that "the music program can exemplify, here and now, the sort of schooling which we all desire and toward which we are moving. . . . Music can, when properly directed, exemplify what education should be at its very best. And it can discharge the great central mission of all education, which is to raise the level of human quality." And again, "all valid educational values are human values Education exists wholly and solely for the sake of life" (18, p. 35).

Mursell suggests that music offers an ideal starting point for reorganizing any school system along vital and progressive lines. To do this we need to think of musical instruction as a program of musical experiences.

> Music is design in sound. Of all the sensory media, tone is most closely connected with emotion. This is a psychological fact. Thus music is the most purely and typically emotional of all the arts. Here we find its essence. This gives music a place of peculiar significance in our scheme of education. It can fill an aching void. School work is directed, almost exclusively, to the intellect. In the ordinary class

> emotion comes as a strange visitor. Music provides avenues and opportunities for emotional experiences as valid and worthy as the intellectual experiences which we furnish . . . it is a refuge for the spirit (18, p.35).

Active participation by performance is more important than just listening.

Music offers splendid opportunities for extending the influence of the school into the community. Some of the possibilities are promoting musical activity in the homes, forming constructive relationships with the churches, taking vital parts in Parent Teachers Meetings, and increasing interest in the community in good concerts.

"Music is an agency for mental growth, because it provides a significant and appealing experience which relates itself naturally and readily to vast ranges of culture and knowledge. One of the most important factors in mental and personal growth is the overcoming of undue repressions and the progressive achievement of the power of free self-expression. Music offers an avenue for disciplined release" (18, p. 123). The shy child can find encouragement for personal expression, and the aggressive child can be helped to coöperate for the good of the group.

A contrasting approach to the evaluation of musical ability and to music education is found in the work of Seashore (23). His idea is to discover musical talent as early as possible by means of scientific measurements and to guide the child with musical talent in his musical education. At present, about the only test of musical talent in general is musical achievement. This method of measurement fails to protect the child without fundamental talent from fruitless years of practicing. Seashore has evolved tests which he feels measure specific musical abilities.

The differing points of view indicated here give some idea of the complexity of this whole area of musical ability and education. The psychological factors are so involved that they are difficult to measure. It is exactly because of this very complexity that the present study attempts to get light from several angles and the whole experiment is something of a survey. The hope is to find whether or not there are significant measurable differences between children who excel in music and those who do not, particularly with respect to parent-child relationships.

C. PROCEDURES

1. *Tests*

A battery of tests was set up to measure some of the aspects of this problem. This thesis presents an approach to the study of musical children, and one that is broader than many in this field. Consequently the design is something of a survey which, it is hoped, will disclose some facts pertaining to the questions under consideration. Other studies might then be done later in the light of whatever relationships may be found in this study.

a. Intelligence tests. Two group intelligence tests were given to the children in each schoolroom in which an experimental subject appeared. From this data it was possible, in most cases, to match the experimental with one of his classmates on *CA*, *MA* and sex. This matching subject then became the control member of a matched pair.

Two-group intelligence tests were used instead of one individual test because it was hoped that the group tests would furnish adequate measurements at a great saving of time and expense.

It is generally conceded that group intelligence tests are less accurate than individual intelligence tests. Freeman states that:

> A rough or basic classification may be made by means of one or more group tests. Two group tests are more valid than a single test, and where it is possible it is advisable to give two tests and take both scores into consideration. If the scores agree, they indicate that the rating of the child is fairly reliable. If they disagree, it is necessary to secure additional evidence before coming to a decision. . . .
>
> It is desirable, furthermore, to check up the rating of the intelligence test in the case of children at the upper or lower extreme, and possibly also in the case of children at the border line between two groups. It is particularly desirable to be sure of the rating of a child who receives a very low score. A low score is more likely to be due to an error than a high score. A child may fail to do himself justice because he does not understand the directions, because he is in poor physical condition, because he is emotionally overwrought by the test, or by some experience just prior to the test (11, p. 383).

And again Pintner maintains:

> The difference between a group test and an individual test lies not only in the number of individuals measured at the same time but also in the method of testing. In the individual test the examiner is expected to put the subject at his ease, to obtain his undivided attention and to encourage him as much as necessary. Without departing from the standard procedure of the test, the examiner may nevertheless see that as many incidental factors as possible are favorable to the subject. If the subject refuses to coöperate, gives poor coöperation, or shows nervousness, fatigue or the like, the examiner stops the test and re-tests at some more favorable opportunity.
>
> With the group test, however, such individual adjustment to the test is impossible. Only in a general way can the examiner make sure of the favorable adjustment of the group as a whole, but individuals

> in the group may not be in the most favorable condition for taking the test. An individual child may be fatigued or frightened or antagonistic, and such conditions may affect his score on the group test. The group test, therefore, is not as pure a measure of intelligence as the individual test (21, p. 182).

To overcome partially this inaccuracy two-group intelligence tests were given and, for reasons which will appear later, the higher of the two scores in terms of *MA* was used in each case as one criterion for matching the subject.

Since the children in this study command a wide range in age and grade placement (9-18 years, and 4th-12th grade) it became necessary to use four different group intelligence tests: two for the younger ages, and two for the older. They are: (*a*) National Intelligence Tests, Scale *A*, Form 1 for Grades 3-8; (*b*) Henman-Nelson Tests of Mental Ability, Elementary School, Form *A* for Grades 3-8, and High School, Form *A*, Grades 7-12; (*c*) Terman Group Tests of Mental Ability, Form *A*, Grades 7-12.

(1). National Intelligence Tests (N. I. T.) were prepared under the auspices of the National Research Council by M. E. Haggerty, L. M. Terman, E. L. Thorndike, G. M. Whipple, and R. M. Yerkes in 1920 for use in Grades 3-8.

Kelley estimates the reliability for a single grade range for Scale *A* to be about .70, and for Grades 4-8 combined to be .92. There are age and grade norms available based on many cases (14, p. 297). It takes about 30 minutes to give this test. Scoring time is about three minutes.

(2). The Henman-Nelson Tests of Mental Ability for Grades 3-8 and for Grades 7-12 were designed by V. A. C. Henman, University of Wisconsin and M. J. Nelson, Iowa State Teachers College in 1931. There are three equivalent forms for each level. In this study Form *A* of each test was used.

According to the revised Teachers Manual of 1944 for Grades 3-8, one method of determining the validity of the Henman-Nelson Tests was by "comparison with other tests which have been proved to be dependable measures of mental ability." A correlation of .853, $N = 234$, was obtained between the *H-N* and the N. I. T. scale for Grade 6 in terms of *IQ*.

The reliability coefficient was obtained by the Split-Halves Method using the Spearman-Brown formula. The resulting reliability coefficients range from .936 to .886 for ages 8-14, and .904 to .858 for Grades 3-8. The *SD* is 16.3 to 12.0, ages 8-14, and 14.2 to 10.8 for Grades 3-8.

The revised Teachers' Manual of 1942 for Grades 7-12 gives the validity when compared with the Terman Group Test, Grades 7-12. The correlation (*MA*'s) was found to be .802 for Grade 8, $N = 235$. Where Means and *SD* are reported the agreement with the Terman Test is quite marked (Table *A*).

TABLE *A*

	Mean *MA*	*SD*	Grade	*N*
Terman group	177.1	19.1	8	235
Henman-Nelson	177.4	18.9	8	235

The reliability coefficients determined by the Split-Halves Method are .936 to .908 for ages 12-17, .903 to .882 for Grades 7-12. *SD* are 15.8 to 14.2 for ages 12-17, 14.1 to 12.9 for Grades 7-12.

These tests are very simple to administer. The time limit is 30 minutes. The scoring is quickly done since the Clapp-Young self-scoring device is employed. Scoring time is about 90 seconds.

(3). For children in Junior High School and High School the Terman Group Test for Grades 7-12, Form A was used. This test was designed by Lewis M. Terman, Stanford University, in 1920. The Test is issued in two equivalent forms, each containing 185 questions or problems. The administration time is about 35 minutes, each of the 10 parts being carefully timed with a stop-watch. Scoring time is about 10 minutes.

Finch and Odoroff computed the reliability of Terman Group Test by the Split-Halves Method. They found it to be .933, $N = 192$, for 12-year-olds, and .926 for 14-year-olds (6).

Franzen found the validity to be .92 for average *MA* of 168-182 months. The Terman Test was compared with 12 other tests which have proved to be dependable group measures of intelligence. He, Franzen, states that the Terman is the test most likely to be good for all around use (10).

According to Easly "there are no other group tests which are unmistakably better. It is not certain that other more recent tests do a better job of measuring mental ability" (4).

While the scoring time is greater than for some popular tests, the high reliability made it worth the additional time involved.

b. Social Acceptance, Smalzried. The Social Acceptance Scale was used to measure the degree to which the class as a whole likes or accepts each member of its group. This Scale was built by combining Moreno Method as revealed in his sociometric test (17) and Thurstone's Method (26) of equal appearing intervals. Smalzried collected 195 items selected to indicate how well the speaker liked the individual (24). These items were collected from mothers, teachers, social workers, the children themselves, as well as from readings. The items ranged from expressions of extreme rejection (dislike) to complete acceptance (like). The items were then scrambled and rated on a 1-9 scale by 30 graduate students and professors in psychology, 1 being low (extreme rejection) and 9 being high (complete acceptance). "The median scale position and quartile deviations were computed from these ratings. The best items in terms of best agreement as to scale value and least amount of spread were made into a scale of 39 items varying in intervals of .2 from the scale value .6 to the scale value 8.5" (5).

These were put in random order in the final form. Each child is asked to rate each member of his class, using a number instead of the name. The Social Acceptance Score for any child is the median placement by all of the children rating him. *Q* is computed.

The reliability of the Scale was estimated (2) by the Split-Halves Method using the Spearman-Brown formula. Coefficient of reliability using 10 groups of 6th grade children ranges from .67 to .91, average .791. On a test retest for one school the reliability coefficient was .83.

c. Play activity check list.[2] One aspect of this study deals with some comparisons of the play activities of the two groups of children. As a means of gathering data to help answer a few of the questions involved the Lehman Play Activity Check List was used. This is a check list of 200 items. The concept of play employed by Lehman and Witty (16) in compiling this list is that "play consists of those activities in which an individual engages just because he wants to."

This list of 200 items was compiled largely from reports of school children. Space is provided at the end of the list for the child to add any play activities not included in the list. The play activity check list is designed for use in elementary schools and high schools.

The reliability of the check list to measure the number of activities in which each child participates (versatility) by test and retest method is $r + .677 \pm .01$ (28, p. 4).

The validity was found by checking results against reports of three teachers on nine clearly defined traits of character for each child. It seems that the number of activities participated in by children "is a fairly satisfactory device to use in identifying groups of deviates in versatility of play interest. The validity of the technique was reflected also in the reports of the teachers regarding the extreme deviates. Three teachers agreed that only 23 of the 300 children . . . *might be* incorrectly placed; they were uncertain regarding eleven of these."

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[2] By permission of A. S. Barnes & Co., New York.

For purposes of this experiment four keys were devised to identify the play activities which might be classified as always, or nearly always: (*a*) vigorous, (*b*) quiet, (*c*) done alone, and (*d*) done with others (group). Twelve judges were used to secure the rankings for the activities considered as always vigorous and those considered as always quiet. The group of judges consisted of six men and six women in which were included one university professor, one college student, two graduate assistants in Psychology, and eight teachers of Physical Education in university and public schools. Each judge was given two unmarked copies of the Play Activity Check List with directions to check the items which seemed to them to be always vigorous on one blank, and those items which seemed to be always quiet on the other. Where there was agreement by 11 or 12 of the judges on an item that item was selected for the key in the category under consideration.

On this basis 36 activities were judged as Vigorous, and 30 items as Quiet. This gives 92 per cent and 100 per cent agreement of judges, which is statistically reliable.[3]

An interesting difference between the judgment of the men and women judges came to light. The six women judged a total of 396 items as Vigorous while the six men judged 449 as Vigorous. The women checked a total of 284 as always quiet, while the men checked 509. One presumably very active man checked 123 of the 200 items as quiet. By using both men and women judges it is likely that a better balanced key was produced than if judge of only one sex had been used.

The college student and one director of physical education, male, were omitted from the group of judges who ranked the activities which were always done with others or always alone. This left six women and four men who were identical with the first group of judges. Agreement by 9 or 10 judges was the basis for selection of items for the key on Group activity. This gave 49 group activities with 90 to 100 per cent agreement of judges. The judges seemed to have difficulty in committing themselves to check items as always done alone. There were no agreements at the 100 per cent level and only three items at 90 per cent. Since the standard of judgment was set so high it seemed logical to include those activities which were checked by five or more judges. This 50 per cent level yielded only 12 activities for the Alone key. Six items showed agreement by six or more judges.

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[3] If chance alone were operating, so that a judge is as likely to call it one way as the other, then the probability of 11 or more judgments out of 12 being in a particular direction are about 1 in 300. This would seem to indicate that something beside chance alone is operating. For 9 or more out of 10 judgments being in a particular direction, the probabilities are about 1 in 99 that something beside chance is operating.

The determination of categories by groups of judges has been frequently used. For instance, the Trabue (27) supplement to the Hillegas Scale for Measurement of Quality in English Composition was derived by the method of ranking by judges. In that scale the special problem was to define increasing amounts of quality. In the keys only the presence or absence of a characteristic was being established. In the Trabue Scale the unit is such a difference in quality as could be recognized by exactly 75 per cent of the judges and not recognized by the other 25 per cent. A total of 139 competent judges was used.

d. Music tests. Because excelling in music was the particular area chosen for this study it seemed important to find two good measures of musical ability. A survey was made by Miss Ruth Jamieson of some prominent music conservatories and departments of music in universities to find out what measures were being used by these institutions to select and classify their music students. The interesting fact came to light that only one of these music schools was regularly using any measure of musical ability. The usual method for judging a student's talent was an appraisal of his skill in performance by the teacher involved. It would seem that there is need for developing a battery of tests for prospective music students which would be more objective and discriminating, and which would have more predictive value than the personal opinion of an ever-so-experienced music teacher.

The two music tests chosen for this study were: (*a*) parts of the Seashore Measures of Musical Talent, Form *A*, 1939 revision, Seashore, Lewis and Saetveit, University of Iowa; and (*b*) Tests of Musicality, E. Thayer Gaston, University of Kansas, 1944. These two tests appear to measure quite different factors in musical ability.

The Seashore Measures were designed with several purposes in view: (*a*) to measure native and basic capacities in musical talent before training has begun, and, therefore, to make them independent of musical training; (*b*) to measure one specific capacity at a time; (*c*) to make the procedure available for group measurements; (*d*) to simplify the use of instruments; and (*e*) to save time.

For this study the tests on Pitch, Rhythm, and Tonal memory were used.

According to Seashore there is an internal validation in terms of the success with which the measured factor is isolated and the degree of control of other factors involved. When we have measured pitch discrimination in a laboratory with a high degree of reliability there is no question but that we have measured pitch.

The reliability of the test on Pitch is between .73 and .90 for high school and college students, and around .83 for eighth grade (19). This is on a test and retest. Reliability of Tonal Memory runs from .67 to .90 on the same groups with the test and retest. The reliability for Rhythm is lower, running between .43 and .50 on these groups. Tests individually administered would be likely to have a higher reliability than group administered tests, according to Seashore.

Form A, which was used here, is designed for use with an unselected group and is a rough screening device.

The Gaston Test of Musicality (12) has been devised to secure information regarding the musical personality of the child or student. It seeks to ascertain the drawing power of music for the individual in question. "It seeks to show his awareness of tonal-rhythmic configurations, and his response thereto."

> The musicality of the average or normal child is not directly dependent upon separate sensory abilities, but instead, it is dependent upon his interaction as a unit, with things of musical influence or significance in his environment. In studying the musical personality of an individual, then, it is necessary to know somewhat of the conditioning factors of his entire musical activity and response. If his attitude is negative or neutral, then all else is of little avail. If it is positive, then, throughout life he will enjoy music. . . .
>
> . . . It seems necessary to determine, is so far as possible, the so-called innate musical capacity or musical sensitivity, of the individual. The general excellence of the sensory equipment must be determined . . . as well as the ability to apprehend musical structure. It is his perceptual rather than his sensory ability that is essential. The chief factor in musicality is an awareness of relatedness among tones. Consequently, since melody is the primary musical phenomenon, melodic apprehension and response may be considered to have high diagnostic significance.
>
> Of great help in evaluation of individual musicality is the information which may be provided by the music teacher of the subject (12, p. 1).

The validity of the test as established by comparing test scores with the music teacher's evaluation of the pupil. The coefficient of validity is .66. Page 1 of the Gaston Test concerns itself with the attitude toward and interest in music. Pages 2 and 3 contain the actual music tests and are scored separately from page 1. Coefficient of validity between scores on page 1 and scores on pages 2 and 3 was found to be .57.

The coefficient of reliability obtained by the Split-Halves Method was .91.

e. Experience appraisal, Spencer. One of the important problems in this study was to find an adequate personality measurement which would reveal any emotional conflicts that might be present. Douglas Spencer (25) worked in this field for a number of years as an outgrowth of his counseling in high schools. In 1938 he published his *Experience Appraisal* which is in many respects a much more delicate and sensitive instrument for detecting emotional conflict than the usual self-report inventories, the paper-and-pencil tests in common use. In these, the question is always present as to whether the subject really knows the correct answer, and if so will he really tell the truth about these personal matters. Presuming that he knows the truth and has told it, his behavior may have a significance in its relation to his personal needs which is quite different from that of another subject who gives apparently the same answer. In any case such subjective material is difficult to score and there are serious problems of establishing validity and reliability. Spencer presents the following hypothesis:

> A given attribute, behavior or experience on the part of individuals in our culture is significant for personality measurement primarily in conjunction with, and by reason of, the subjective relativities of the concrete experience. Abstractly considered, most segments of experience, behaviors, habits, attitudes, or personality variables have no certain meaning for measurement; they are significant only in relation to those aspects of each individual's experiencing which give personal meaning to the variable. The fact of a specific behavior or experience in the case of a given person, regardless of its frequency or rarity in the general population, is of less significance than the meaning of the occurrence determined or conditioned by various subjective contingencies or concomitants of the concrete experience (25, p. 60).

The propositions underlying Spencer's fundamental hypothesis are: (*a*) that the abstract behavior items which usually make up the self-report personality inventories cannot be scored right or wrong, favorable or unfavorable for adjustment; (*b*) that neither the frequency nor the intensity of most experiences can be relied upon as cogent evidence in appraising their significance for individual adjustment; (c) that responses to samples of abstractly scored items of behavior cannot be added together to give a valid index of the individual personality; nor can selections of such items be grouped together, however refined the statistical techniques, to provide dependable measurements of personality traits.

These remaining propositions are correlative: (*a*) that data of self-reports, as usually collected on signed personality instruments, are not free from distortion due to deception and evasion by the subjects; (*b*) that self-appraisals and self-descriptions by subjects do not in themselves constitute demonstrations of personality which are accessible for measurement.

Conflict may be described as some aspects of continuous personality adjustments. As social beings, individuals make self-appraisals in terms of social forces. Comparison of the self with others is an early and almost continuous process. Spencer proposes to ask the individual to report as to his own behavior or characteristics in regard to certain fulcra or localized conflict areas. These are six in number: (*a*) the individual's report as to his own beliefs, ideals, or aspirations in regard to the variable; (*b*) his report of what he believes are his mother's beliefs, ideals, or aspirations in regard to the variable; (*c*) his report of what he believes are his father's beliefs, ideals, or aspirations in regard to the variable; (*d*) his report as to his mother's own behavior or experience in regard to the variable; (*e*) his report as to his father's own behavior or experience in regard to the variable; (*f*) his report as to the behavior or experience of his closest associates in regard to the variable.

Personality conflict may now be defined as the degree of discrepancy and incongruity between the individual's report of his own characteristics or behaviors and his report on corresponding items in relation to the fulcra. In Section *G* of the instrument the subject reports on his own behavior or characteristics on the same items found in the six previous sections. In order to secure frankness and safeguard the identity of the subjects in Spencer's study and in the present study the reports were unsigned. A system of code numbers was devised in each case for the purposes of the experiment.

The "appraisal" is made up of 53 items selected from case studies and experiences of adolescents. An effort was made to adapt the content and language to their modes and to keep the problems of adolescents in mind. Care was taken to exclude any items which might bring criticism or embarrassment to the school authorities. Each item consists of three statements roughly graded as: (*a*) Good, or high; (*b*) Medium, or average; (*c*) Poor, or low. In each case the subject checks the statement that fits best.

The responses on the *G* section provide the basis for scoring the conflict. For example, if the *G* response on the importance of religion is low and other responses are high this seems to indicate a discrepancy between the behavior of the subject and his ideals as well as that of his family. If the *G* response is low all middle responses are scored one point each and all responses which are high are scored two points each. The item conflict score is the sum of the discrepancies between the *G* response and the fulcra responses above the *G* response. In addition, the points of conflict yielded by Fulcrum *A*—the subject's Ideal—are given double weight. The sum of the item conflict scores gives the total conflict score.

This is made clearer by the sample of scoring on one item given in Table 1. On 25 items logically selected, additional conflict scores were included in the total wherever the *D* or *E* response fell below both the subject's ideals (*A*) and his behavior (*G*). One step below the *G* response is scored 1, and two steps below, 2. Experience shows that this additional scoring adds very little to the total score.

TABLE 1
SAMPLE OF SPENCER'S SCORING (25, p. 110)

		Own ideals fulcrum *A*	Mother's ideals fulcrum *B*	Father's ideals fulcrum *C*	Mother's behavior fulcrum *D*	Father's behavior fulcrum *E*	Associates' behavior fulcrum *F*	Own behavior fulcrum *G*
	High	X	X	X				
Item 3	Middle				X		X	
Religion	Low					X		X
	Conflict	X 2 =						Total
		4	2	2	1	0	1	10

The validity of the "Experience Appraisal" was established by internal evidence. Correlations of sectional scores against total scores and intercorrelations of the sections indicated the amount of consistency in the instrument. The average correlation of the sectional scores with the total scores was .84; the average intercorrelation between sections was .67. There appears to be enough consistency in the data to conclude that the test as a whole has considerable validity.

The problem of measuring the reliability of the "Appraisal" has certain logical difficulties. The Split-Halves Method seemed not applicable; the items in the test are concerned with such distinctly different aspects that odd versus even items could not be relied upon to give equivalent results. Instead, a retest was made on Sections *A, F,* and *G* and scored as before. This yielded a reliability coefficient of .914. There is, of course, a question as to whether the retaking of such an instrument as this, dealing with emotional issues, may not yield an actually different measure the second time in as much as the individual may be somewhat changed by taking the test. However, the obtained test-retest correlation as stated above is high. The intercorrelation of the six sections corrected by the Spearman-Brown prophecy formula, yielded a reliability coefficient of .923.

The "Appraisal" was designed for use with high school students. The chronological age range of subjects in the present study is from 112 months (9 years, 4 months) to 211 months (17 years, 7 months). The mental age range is from 124 months (10 years, 4 months) to 275 months (22 years, 11 months). It is obvious that many of the abstract words and concepts used in the items of the "Appraisal" are too difficult for the mental age of the elementary school children. However, for experimental purposes, it was decided to use the "Appraisal" on the entire group and to decide from evidence obtained during its administration and from completeness of the responses, at just what point to consider the test applicable. This point was finally set at the level of the seventh grade, junior high school. The lowest mental age for any seventh grade subject is 158 months (13 years, 2 months). At a mental age of 12 years on the Stanford-Binet individual intelligence test a passing score involves knowing the meaning of such abstract words as curiosity, pity, obedience, revenge, and tolerate. From this it would seem that our subject of 13 years, 2 months could cope with the material in the "Appraisal." Furthermore, while the children in the elementary school group needed considerable help on the meanings of words and concepts and grew a little restive with the difficulty and length of the test, the children of the Junior High School went at it eagerly and for the most part enjoyed the opportunity to express themselves freely without being identified. Very few questions were asked about meanings of words and they finished quickly. At the seventh grade level almost no items were omitted. It was felt, for these reasons, that it was justifiable to include responses from those subjects who were in the seventh grade or higher.

f. Multiple Choice Group Rorschach Test. One of the oldest methods of obtaining information about an individual's personality is by means of the interview. In the hands of a well trained person the interview can be very revealing. The method of obtaining insight into an individual's personality pattern by individual interview, however, is slow and costly; furthermore to be at all valid it can be employed only by properly trained workers.

From one point of view, all tests and measuring devices are attempts at a modification of the interview along the line of standardizing procedure and gathering data which is capable of statistical manipulation. Some tests attempt to measure isolated factors or traits, others endeavor to secure a more nearly "whole" reaction of the individual.

An early method of personality measurement was the free-association method developed by Rosanoff and others. Various modifications have been offered by different investigators. Rorschach, a Swiss physician, became interested in the revealing responses elicited by inkblots. He selected ten inkblots, from many thousands, to serve as stimulus material in diagnostic procedure. There is more here than mere imagination; recent clinical studies suggest that the personality structure is revealed. Frank states that:

> The Rorschach method offers a procedure through which the individual is induced to reveal his "private world" by telling what he "sees" in the several cards upon which he may project his meanings, significance, and feelings, just because they are not socially standardized objects or situations to which he must give culturally prescribed responses. . . . It is just because a subject is not aware of what he is telling and has no cultural norms behind which to hide himself, that the Rorschach and other projective methods are so revealing (9).

There is a strong interplay between the objective features of the inkblot and the individual projection of the observer. This is essentially an individual procedure and should be used only by a person highly trained in the method (15). The Rorschach does not lend itself easily to statistical procedures. The interpreter is concerned not so much with the sum of components as with a configuration or "Gestalt." A system of scoring has become standardized, though the instrument must remain sensitive to nuances. The validity and reliability have not been statistically established, though skilled Rorschach interpreters believe they can diagnose a case from the returns of an interview as accurately as a psychiatrist or analyst from his interview.

Since the Rorschach is essentially an individual test, large scale application was impossible without some modification. During the recent war the urgency of the demand for measuring personality traits led to experiments in group techniques with the Rorschach as well as other tests. During 1941, Harrower-Erickson introduced such a method with the Rorschach (13). In this technique the Rorschach inkblots, 5 black and 5 in colors, are reproduced on slides and projected onto a screen. Harrower-Erickson explains that:

> The essence of the group method is contained in the following ideas: the important features of a Rorschach record can be obtained if the subject writes down what he sees in the inkblots when these are projected on the screen in front of him, instead of reporting his perceptions to the examiner. In doing this he may be a member of a large group of several hundred persons who are also engaged in recording their responses in this way (13).

The Multiple Choice Test used in the present study is the revised form of June 1, 1943. This form has printed answers which are to be underlined or checked by the subject. There are three groups of 10 answers each for each inkblot, making a total of 300 possible responses. In choosing the content of categories for the blank the investigators tried as far as possible to retain those in common usage. The answers are roughly classified as "good" or "poor," five answers at each extreme. A percentage of poor is taken as the cutting point at which a subject seems to indicate disturbance, rather than an absolute number. If poor answers constitute 60 per cent of the total answers the individual should be screened for more careful individual study. Cases with scores from 40 to 60 per cent poor responses should be investigated. Complete failure to respond, classification No. 10, should be scored as *two* poor answers.

One method to test the validity of the Multiple Choice was differential diagnosis. Two hundred subjects were selected at random from groups of neuropsychiatric patients. "Evaluations of these 200 subjects were written by various psychiatrists in the normal hospital procedure of case treatment. Each of the 200 Multiple Choice records were analyzed independently and a blind description of the personality made" (13, p. 205). The amount of agreement between the two interpretations was expressed in four categories ranging from complete agreement to complete disagreement. The data show 90 per cent of either complete agreement or partial agreement within one step, or complete agreement in 70 per cent.

The same data were used to test the reliability. Here agreement between raters as to degree of maladjustment was found to be 70 per cent in complete agreement with only 5 per cent showing disagreement.

The present author devised a tabulating and scoring sheet for recording the results of the revised Multiple Choice Test. Details were in line with the most recent method of evaluations given by Harrower-Erickson.

g. Graves Scales. One phase of the present study concerned itself with the attitudes of the subjects, both parents and children, toward: music lessons, practicing, playing in public, the social value of music lessons, and the like. There appeared to be no scales available to measure these attitudes. According to Newcomb, ready-made attitude scales tend to "measure stereotyped attitudes evoked by symbols." He recommends that "a specific continuum should be constructed for each attitude" (3).

With this in mind seven graphic rating scales were evolved to measure different aspects of this problem. The graphic rating scale is a device which is frequently used to estimate the amount of a trait or attitude which is present. It makes no attempt to secure equal-appearing intervals, but describes points at which the rater may indicate the subject's standing with respect to the attitude or trait in question (22). The scales for his study are 9-point scales. Allport gives the minimum number of intervals for rating scales as 7. Ratings with fewer intervals than 7 "suffer from a loss of reliability because of the coarseness of the grouping" (1). The 9-point scale has the advantage of presenting the rater with a mid-point between either extreme and the middle. Three descriptive phrases were placed along the line, an extreme at each end and a neutral point in the center.[4]

The following Scales were evolved:

Graves Scales on Music Education

Graves Scale No. 1, Music Teacher's Appraisal of Pupil.
Graves Scale No. 2, Music Pupils' Attitude toward Music.
Graves Scale No. 3, Children's Attitude toward Music (those not taking music lessons).
Graves Scale No. 4, Parents' Attitude toward Child's Music Lessons and Performance.
Graves Scale No. 5, Parent's Childhood Experiences in Music.
Graves Scale No. 6, Vocational Preference List for Parents.
Graves Scale No. 7, School Teachers' Appraisal of Pupils.

Copies of the Scales were sent to 10 judges. The judges included eight professors and graduate assistants from the Psychology department and two professors from the English department. A letter, asking for comments and criticisms, accompanied the Scales. Many valuable suggestions were given by these judges. The Scales were revised in line with these suggestions. The resulting one in each case is the one which was used for this study.

When the Scales were put into actual use to gather the required data several faults became evident. For instance, Scale No. 2, Music Pupil's Attitude toward Music for Experimentals, and Scale No. 2, Children's Attitude toward Music for Controls, should be parallel throughout for comparable scoring. Items 6*a* and 6*b* in Scale No. 3 could be identical with Item 8 in Scale No. 2. Parents' Attitude toward Music Lessons and Performance, Scale No. 4, is designed with the parents of the Experimentals in mind. A comparable form for the parents of Controls should be evolved omitting items about how much satisfaction the child gains from playing, and the value to the child of playing in public. These points among others will be considered in a revision of the Scales.

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[4] The author is deeply indebted to Miss Ruth Jamieson for her help in writing the description.

2. *Selection of Subjects*

The original design of the present experiment called for 60 subjects who excel in music performance, the experimental subjects, and 60 matching control subjects together with their parents. The experimental subjects were selected by a teacher of piano and a teacher of band and orchestral instruments.[5] Each teacher was asked to select 15 of his pupils who were high in musical performance and 15 of his least accomplished pupils. This composed the experimental group.

In order to gain permission to use the children necessary for the study (both experimental and control), letters were sent to the parents of the children selected asking for such permission and explaining the purposes of the study. Emphasis was placed upon the fact that returns from tests given to the children would be strictly confidential, for instance, code numbers were used to insure anonymity so that no child could be identified even by those scoring the tests. A reply card was enclosed with each letter. Follow up letters and telephone calls were used for those parents who did not respond within a reasonable time.

Each experimental subject was paired with a control subject who matched him in: (*a*) schoolroom they were then in (same socio-economic status and same child-community), (*b*) sex, (*c*) age, (*d*) intelligence, and (*e*) both parents living. The control subjects were selected from ones who were not then taking or who had not previously taken individual music lessons.

In order to gather the data necessary for such matching it was necessary to run two group intelligence tests in each room in which an experimental subject appeared. In all, the schools involved, included three consolidated country schools and two city school systems. A letter was sent to the superintendent of each school system asking for permission to run the tests in his schools. Permission was granted in all cases; the superintendents, principals and teachers were interested and very coöperative. Information about whether or not music lessons were being taken by each child or any member of his family was gathered at the time of the administration of the first intelligence test. The marital status, that is both parents living and at home, or not, was ascertained.

When the intelligence tests were scored it was found that a child might have a higher mental age on one test than on the other. Since a person may score lower than his real ability but cannot score higher than he can, it was decided to use the higher mental age in each case rather than the average of the two. This method would not penalize the child who, for some reason, was not at his best when taking one of the tests.

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[5] The author is indebted to Ruth Jamieson, prominent local piano teacher, and Marshall W. Howenstein, Supervisor of Music in West Lafayette Public Schools, for their help in selecting experimental subjects and for their interest in the whole experiment.

It was important to determine whether the mental age yielded by either of the tests used ran consistently higher or lower than that obtained by the other test. To examine this question, 49 pairs of cases were collected for the H-N Grades 3-8 and the N. I. T., and 49 pairs for the H-N, 7-12 and the Terman, 7-12. The Critical Ratios between the two tests in each case are given in Table 2. It can be seen that any differences that occur are purely chance differences, which then allows the use of the higher of the two tests for the individual without confusing the findings even though the scores utilized for some children will be from one test and the score used for the other children from the other test.

TABLE 2
COMPARISON OF THE TWO INTELLIGENCE TESTS GIVEN EACH CHILD

	N	*MA* (months)	Mean	σ	*CR*
H-N Grades 3-8	49	106-195	151.78	23.64	
N. I. T. Grades 3-8	49	106-205	154.02	21.43	.49
H-N Grades 7-12	49	145-240	196.27	24.80	
Terman Grades 7-12	49	141-235	190.27	20.05	1.23

Some difficulties were encountered during matching especially on the item of "not taking music lessons." It was found that so many children were either taking music lessons now or had taken them previously that this restriction had to be changed in order to include some who had taken music lessons but were not doing so at the time of matching. In a few schoolrooms where several experimentals were found, there were not enough children of the same sex to furnish the matching controls which were needed. In two cases the control is from another schoolroom but in the same grade and school building. Two girls could not be matched because of very high mental age in each case. Altogether there were eight experimentals who could not be matched but the records of these subjects were not included in the statistical findings of the study (Table 3).

A more detailed accounting of the Experimental and Control groups' chronological age and mental age will be given later (see Table 6).

One of the important aspects of the present study is parent-child relationships. The attitude of the parents toward music lessons and the like may have an influence on the behavior and attitudes of the children. Further-

TABLE 3
EXPERIMENTAL AND CONTROL SUBJECTS

	N	% of total	*CA* range in months	*MA* range in months
Elementary School	24	27	112-133	124-183
Junior High School	54	62	144-175	158-232
High School	10	11	182-208	194-275
Total	88	100	112-208	124-275
Mean			153	182
Sigma			29.87	32.25

more, Fitz-Simons found that a record of the father's attitudes was essential in understanding the child's behavior. Therefore an attempt was made here to include as many fathers as possible, as well as mothers, among the parent-subject group. Letters with reply cards were sent out soliciting the cooperation of both parents in this part of the study. Telephone calls and follow-up letters helped to explain the plan and secure more parent-subjects with the final results which are found in Table 4.

TABLE 4
NUMBER OF PAIRS OF EXPERIMENTAL AND CONTROL SUBJECTS, CHILDREN AND PARENTS

	Children Pairs E & C *N*	Parents—E & C Pairs *N* Fathers	*N* Mothers
Group I, Complete Records	25	25	25
Group II, Children's Records Complete—Mothers Only	15	0	15
Group III, Children's Records Complete—No Parents	4	0	0
Total Pairs	44	25	40

In two cases in Group I there were two children from one family in the Experimental group and one such combination in the Control group. In these cases the parents' records were used twice, once for each child. Two such family patterns are also found in Group II.

Although no comparisons based on sex are made in the present study, for those who are interested, Table 5 gives the number of pairs of boys and girls who served as subjects.

TABLE 5
SUBJECTS CLASSIFIED AS TO SEX

Pairs	Boys	Girls	Total pairs
Group I (E and C)	9	16	25
Group II (E and C)	6	9	15
Group III (E and C)	2	2	4
Total pairs	17	27	44

3. *Procedures*

a. Children.[6] For ease in handling during testing and for keeping the grade level somewhat similar for each unit, the whole group of children was divided into smaller units for the administration of the battery. Double reply cards were sent out to arrange for appointments and also to give each child-subject his code number. Most of the testing was done after school except for those children who lived in rural areas. The rural children were taken on Saturday afternoons. An attempt was made to have matching subjects come to the same session. The order of the battery for the Experimentals and Controls was as follows:

> In the schoolroom, Smalzried Social Acceptance Scale:[7]
>
> Meeting 1. Play Activity Check List, Seashore Music Tests.
>
> Meeting 2. Music Pupil's Attitude toward Music, Graves Scale for Experimentals (No. 2).
>
> Children's Attitude toward Music, Graves Scale for Controls (No. 3).
>
> Gaston Test of Musicality, pp. 1, 2, and 3.
>
> Meeting 3. Spencer Experience Appraisal.
>
> Meeting 4. Rorschach: Harrower-Erickson Multiple Choice Group Test.

Directions for the administration of each test were followed accurately as they are found in the appropriate manuals referred to in Section 1 of this chapter.

No phonograph records were available for the music examples in the

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[6] As has been previously stated, the entire schoolroom in which an Experimental subject was found was given two group intelligence tests in order to locate the children who could be used as control subjects.

[7] In the elementary schools each schoolroom in which a subject was located was given the Smalzried Social Acceptance test as a whole group. In Junior and Senior High Schools a class in which a subject was located was given the Social Acceptance test during a study period. In some cases it became necessary to draw some children out of another study hall in order to get a functional social group.

The Social Acceptance testing was done early when the intelligence testing was done thus preceding the rest of the battery by from one to six months.

Gaston Test. It was felt that records would make the giving of the test much more uniform than the playing of a performer could be on different occasions; therefore, records were made locally.[8, 9]

With the exception of the Gaston Test of Musicality the test records were identified by means of the child's code number rather than his name. It was felt that the child would be freer to express his real feelings, especially about issues with emotional content, if his record were anonymous. (Since no emotional questions were involved in the Gaston Test, and since the first units had signed names it was continued in like manner throughout the group.)

The last page of the Gaston is taken up with the music teacher's appraisal of the pupil. This is designed for use largely in public schools to help select those children who might be available for band and orchestra and the like. The Graves Scale, Music Teacher's Appraisal of the Music Pupil, Scale No. 1, had already been evolved before the Gaston Test was found. It seemed unnecessary to burden the music teachers with two evaluations, therefore the last page of the Gaston was not used.

b. Parents. Only one meeting was necessary for each one of the parents. Appointments were made by means of reply cards.

The order of the battery for the parents was as follows:

Parents' Attitude toward Children's Music Lessons and Performance, Graves Scale No. 4.
Childhood Experiences with Music, Graves Scale No. 5.
Vocational Preference List. Graves Scale No. 6.
Rorschach: Harrower-Erickson Multiple Choice Group Test.

Each parent used his child's code number on the test records rather than his own name.

Since many of the parents, especially the fathers, were unusually busy with extra war jobs, it was impossible to make convenient appointments for all of them to take the tests with the large groups. Individual appointments were made by telephone and the tests given individually. It is possible that this might make a slight difference in the reactions to the Rorschach because the inkblots look a little different when seen on slides from when seen on the regulation cards. The cards were used for the individual tests.

c. Teachers. Both school teachers and music teachers were asked to evaluate the child-subjects whom they knew. In the case of the school

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[8] Permission to make records granted by Streep Music Company, Kansas City, Mo.

[9] The author is again indebted to Miss Ruth Jamieson, who worked out the directions and the music examples of the Gaston pages 2 and 3 and made excellent recordings which were used throughout the experiment.

teachers an attempt was made to get the appraisal of three teachers for each child. The rating scales for music teachers and school teachers are as follows:

Music Teachers: Music Teacher's Appraisal of Pupil, Graves Scale No. 1.

School Teachers: School Teacher's Appraisal of Child, Graves Scale No. 7.

The hope was that the teachers would express themselves freely within the limits of the instrument. To help secure a frank return from the teachers they were asked to keep their ratings confidential and not to discuss any child with another teacher. The teachers were given their own code numbers for their protection.

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FACTORS ASSOCIATED WITH CHILDREN'S TAKING MUSIC LESSONS, INCLUDING SOME PARENT-CHILD RELATIONSHIPS: II. RESULTS AND CONCLUSIONS*

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WINIFRED SIBLEY GRAVES

A. RESULTS

1. *Statistical Procedures*

The Fisher *t* test was chosen as the statistical device best suited to deal with the small numbers found in the present experiment (7). The chief interest here is in comparisons between groups of Experimentals and Controls. The difference between means was computed by Fisher's *t* test.

Fisher formula for *t* test:

$$\bar{X}_1 = \frac{\Sigma X_1}{N_1} \quad \bar{X}_2 = \frac{\Sigma X_2}{N_2}$$

$$s^2 = \frac{\Sigma(X_1 - \bar{X}_1)^2 + \Sigma(X_2 - \bar{X}_2)^2}{N_1 + N_2 - 2}$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{s} \sqrt{\frac{N_1 N_2}{N_1 + N_2}}$$

By use of Fisher's Tables this quickly yields a *p* value which is the percentage of likelihood that the obtained difference was due to chance.[1]

In Section Q, below, a critical ratio is calculated for a difference between percentages. The standard error of each percentage is calculated according to the following formula (20):

$$\sigma_p = \sqrt{\frac{pq}{N}}$$

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[1] A *p* of .05 or less is generally considered significant.

The standard error of the difference then becomes:

$$\sigma_{diff.} = \sqrt{\sigma_{p1}^2 + \sigma_{p2}^2}$$

The critical ratio is the difference between the percentages divided by the standard error of the difference:

$$CR = \frac{p_1 - p_2}{\sigma_{diff.}}$$

Pearson's product-moment correlation was used in Sections *K*, *M*, and *O* below. The correlations were machine calculated around *O* as the assumed mean by the formula:

$$r = \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

In cases where the correlation was obviously non-linear the ϵ^2 correlation ratio without bias, was used (see Sections *M* and *O* below).

Formula: $\epsilon^2 = \dfrac{(N-1)\eta^2 - (k-1)}{N-k}$

2. *Findings*

a. Children.

(1). *Chronological age.* For the complete Group I ($N = 25$ pairs) the Experimental mean chronological age was 148.6 months (12 years, 2 months); the mean chronological age of the Controls was 151.8 months (12 years, 7 months). This is not a significant difference as is shown by a *p* of .46. For the larger Group II ($N = 40$ pairs), including those with mothers only, the *p* is .71; and for the entire Group III ($N = 44$ pairs), including those with no parents, the *p* is .51. These data indicate that the groups are matched in chronological age (see Table 6).

(2). *Mental age.* The mean mental age of the Experimentals in Group I ($N = 25$ pairs) was 186.6 months (15 years, 6 months); that of the Controls was 184.4 months (15 years, 4 months). This is a purely chance difference as shown by a *p* of .73. For Group II ($N = 40$ pairs) *p* is .66, and for Group III ($N = 44$ pairs) *p* is .78. These findings indicate that the groups are matched in mental age (see Table 6).

In a few cases there was an interval of several months between the giving of the two intelligence tests. When this occurred a tentative match was made by means of the records from the first intelligence test. The mental age of

TABLE 6

	Group I, Complete Records, Experimentals and Controls							Group II, Children's Records Complete, Mothers only						
	Group I							Groups I plus II						
		E		C					E		C			
Measurements	Pairs N	M	σ	M	σ	t	p	Pairs N	M	σ	M	σ	t	p
Chronological Age	25	148.6	18.8	151.8	21.4	.7784	.46	40	152.8	23.6	154.8	24.7	.3704	.71
High Mental Age		186.6	26.8	184.4	25.3	.2984	.73		183.9	34.2	180.9	31.7	.4029	.66
Seashore Music Pitch		41.12	7.08	32.96	8.43	3.7124	.001		39.38	7.68	34.18	6.77	3.2194	.001
Seashore Music Rhythm		24.44	3.79	23.72	3.49	.6916	.49		24.53	3.44	23.75	3.27	1.0388	.3
Seashore Music Tonal Memory		26.12	4.32	22.04	6.23	2.6903	.01		25.8	4.12	22.15	6.04	3.1628	.001
Gaston Musicality (Pages 2 and 3),		45.52	6.14	37.04	8.92	3.9143	.001		45.5	6.29	36.08	6.26	6.7162	.001
Gaston Attitudes (Page 1)		29.12	5.89	20.04	7.58	4.7287	.001		29.1	5.52	19.75	9.10	5.5573	.001
Graves 2 for E, 3 for C attitude toward music lessons														
Omit parents' item		25.94	4.84	24.0	6.53	1.1927	.23		26.0	5.49	23.7	5.98	1.7888	.056
Graves 2 and 3 (include parents' item)		34.1	5.18	30.8	7.65	1.7864	.056		33.29	9.24	30.48	7.0	1.5339	.13
Play Activity (P. A.) group		6.52	3.3	6.24	3.9	.2743	.79		6.2	3.42	6.3	3.45	— .0976	.9
P. A. alone		5.24	1.7	5.24	1.9	0			5.18	1.74	5.25	1.76	— .0606	.9
P. A. Vigorous		4.2	3.07	4.32	3.45	— .1299	.89		3.9	3.88	4.18	4.16	— .3115	.75
P. A. Quiet		11.0	3.73	10.16	3.74	.7952	.43		10.8	3.67	10.1	3.43	.8813	.36
P. A. Total		26.32	9.46	26.0	10.57	.1128	.9		25.7	9.4	25.3	8.8	.2218	.83
Social Acceptance (S. A.)														
% of judges per N in schoolroom		.34	.16	.33	.19	.0399	.9	39	.39	.18	.33	.18	1.4891	.14
S. A. number of mentions per judge		2.08	.92	1.92	.73	.6812	.5	39	2.13	.81	2.06	1.1	.3133	.75
S. A. Score (Mdn.)		5.53	1.72	5.44	1.5	.1412	.89	39	5.43	1.73	5.41	1.42	.6974	.49
S. A. Q		1.83	.94	1.64	.98	.6912	.49	39	1.60	.86	1.56	.93	.1627	.83
Rorschach total choices		50.12	22.9	46.92	15.98	.575	.53	40	48.83	17.06	49.68	28.16	.1926	.85
Rorschach % total poor		.26	.152	.30	.196	— .8564	.39		.27	.19	.32	.18	—1.1131	.26
Rorschach % wt. poor		.25	.18	.31	.22	—1.0506	.29		.28	.29	.31	.21	— .5084	.61
Spencer Conflict Score	17	51.65	35.17	70.82	39.34	—4.7378	.001							

TABLE 6 (*continued*)

Group III, Children's Records Complete, No Parents
Groups I plus II plus III

Measurements	Pairs *N*	E *M*	E σ	C *M*	C σ	*t*	*p*
Chronological Age	44	150.89	35.2	155.2	23.7	.66673	.51
High Mental Age		182.9	34.5	180.9	31.5	.2784	.78
Seashore Music Pitch		39.23	7.38	34.45	6.82	3.1433	.001
Seashore Music Rhythm		24.93	3.8	23.86	3.34	1.4009	.18
Seashore Music Tonal Memory		25.77	4.21	22.39	5.84	3.1174	.001
Gaston Musicality (Pages 2 and 3),		45.34	6.26	36.45	8.35	5.6504	.001
Gaston Attitudes (Page 1)		28.75	5.47	19.64	8.74	5.8577	.001
Graves 2 for E, 3 for C attitude toward music lessons							
Omit parents' item		25.88	5.24	23.70	5.95	1.8234	.054
Graves 2 and 3 (include parents' item)		33.15	8.9	30.48	6.9	1.5692	.15
Play Activity (P. A.) group		6.25	3.4	6.30	3.6	.06	.9
P. A. alone		5.16	1.75	5.34	1.72	.4911	.63
P. A. Vigorous		3.95	2.98	4.34	3.30	— .5731	.56
P. A. Quiet		10.34	3.97	10.39	2.63	.0696	.9
P. A. Total		25.2	9.14	26.13	9.9	.4599	.65
Social Acceptance (S. A.) % of judges per *N* in schoolroom	43	.38	.18	.34	.18	1.091	.22
S. A. number of mentions per judge	43	2.05	.83	2.03	1.2	.0912	.9
S. A. Score (Mdn.)	43	5.39	1.75	5.34	1.5	.1136	.9
S. A. *Q*	43	1.67	.87	1.55	.91	.6434	.52
Rorschach total choices	44	48.73	18.96	50.02	19.81	.3120	.75
Rorschach % total poor		.26	.182	.32	.18	— 1.4653	.15
Rorschach % wt. poor		.27	.28	.32	.22	— .8694	.38
Spencer Conflict Score	31	61.29	40.05	72.13	37.66	—10.9775	.001

the later record was calculated back to what it would have been at the time of matching and the corrected *MA* was used in the data.

It was not always possible to test the Experimental and his matching Control at the same time. In such cases the same device was used to yield a simultaneous mental age for matching purposes.

(3). *Seashore pitch.* For the Experimentals, Group I (*N* = pairs) the mean score on Pitch was 41.12; for Controls it was 32.96. This difference is highly significant as shown by a *p* of .001. For Group II (*N* = 40 pairs) *p* is .001, and for Group III (*N* = 44 pairs) .001 (see Table 6). If Seashore's contention is correct that pitch discrimination is unlearned, these findings would suggest that children in a community who are taking

TABLE 7

SEASHORE PITCH

	Experimentals		Controls	
48-49	2			
46-47	5		2	
44-45	6		2	
42-43	6		4	
40-41	6		1	
38-39	4	$M = 39.23$	8	
36-37	6	$\sigma = 7.38$	3	
34-35	3		7	$M = 34.45$
32-33	1			$\sigma = 6.82$
30-31	1		4	
28-29			6	
26-27	1		3	
24-25	1		2	
22-23			1	
20-21	1			
18-19	1		1	
	$N = 44$		$N = 44$	

music lessons are highly selected in this trait. Presumably further research would be profitable to determine whether these findings might indicate a high degree of learning in pitch discrimination.

(4). *Seashore Rhythm.* For the Experimentals, Group I ($N = 25$ pairs) the mean score in Rhythm was 24.44; for the Controls, 23.72. A p of .49 indicates that the difference is not significant. Group II ($N = 40$ pairs), Experimentals and Controls shows no significant difference with a p of .3, nor does the Group III ($N = 44$ pairs) with a p of .18. There may be a trend here toward a real difference which would come to light with an increase in the number of subjects (see Table 6).

(5). *Seashore Tonal Memory.* The Experimentals Group I ($N = 25$ pairs) had a mean Tonal Memory score of 26.12 and the Controls, of 22.04. This is a highly significant difference as shown by a p of .01. Group II ($N = 40$ pairs) with a p of .001 and Group III ($N = 44$ pairs) with a p of .001 also show highly significant differences (see Table 6).

The same question could be raised here as in connection with pitch as to whether the real difference is the result of selection or learning.

(6). *Gaston Musicality: Score in Musicality (Pages 2 and 3).* The Experimentals, Group I ($N = 25$ pairs), had a mean Musicality score of 45.52, and the Controls, one of 37.04, showing a highly significant difference as indicated by a p of .001. Group II ($N = 40$ pairs) had a p of .001 and Group III ($N = 44$ pairs) a p of .001, indicating a highly significant

TABLE 8
SEASHORE TONAL MEMORY

	Experimentals		Controls	
30	5		4	
29	6		6	
28	10		3	
27	3		3	
26	8			
25	2	$M = 25.77$	3	
24	2	$\sigma = 4.21$		
23	1		3	
22			2	$M = 22.34$
21			4	$\sigma = 5.84$
20			2	
19	2		2	
18			1	
17	3		1	
16	1		2	
15	1		3	
14			1	
13			2	
12			2	
	$N = 44$		$N = 44$	

difference between Experimentals and Controls for all of the three groups (see Table 6).

A matter of great interest to music teachers and to parents of children about to begin taking music lessons is whether this decisive difference in understanding of music is an accomplishment which can be learned. The present experiment cannot shed light on the point, but it does throw into relief that there is a genuine difference in "Musicality" between those with and without music lessons, which needs explanation.

(7). *Gaston Musicality: Attitudes toward Music (Page 1).* The Experimentals, Group I ($N = 25$ pairs), had a mean Attitude score of 29.12, and the Controls one of 20.04, yielding a p of .001 which discloses a highly significant difference. Group II ($N = 40$ pairs) and Group III ($N = 44$ pairs) each have a p of .001. The difference between Experimentals and Controls is highly significant for all three groups (see Table 6).

Here again studies are needed to determine whether the musically inclined take music lessons or whether music lessons develop interest in music.

(8). *Attitude toward Music.* On the Graves Scale of Attitude toward Music for music pupils (Graves Scale No. 2) and on the parallel Graves Scale for children not taking music lessons (Graves Scale No. 3):

(*a*). Omitting Item 4 on each Scale, which concerns parents' atti-

TABLE 9
GASTON PAGES 2 AND 3

	Experimentals		Controls	
57-59			1	
54-56	3			
51-53	8		3	
48-50	8			
45-47	5	$M = 45.34$	3	
42-44	7	$\sigma = 5.52$	5	
39-41	6			
36-38	5		6	$M = 36.45$
33-35	1		9	$\sigma = 8.35$
30-32	1		6	
27-29			5	
24-26			1	
21-23			1	
18-20			1	
	$N = 44$		$N = 44$	

tude, the Experimentals, Group I ($N = 25$ pairs), had a mean score of 25.94, and the Controls one of 24.0. A p of .23 shows no significant difference. Group II ($N = 40$ pairs) with a p of .056 and Group III ($N = 44$ pairs) with a p of .054 show the possibility of there being a real difference between the Experimentals and the Controls (see Table 6).

(*b*). Including item concerning parents' attitude: the Experimentals, Group I ($N = 25$ pairs), had a mean score of 34.1 and the Controls one of 30.8. The p of .056 shows a probably significant difference which curiously enough becomes less certain since Group II ($N = 40$ pairs) has a p of .13 and Group III ($N = 44$ pairs) a p of .15 (see Table 6).

(9). *Play Activity Check List.*

(*a*). *Group activities.* The Experimentals, Group I ($N = 25$ pairs), had a mean of 6.52 activities done with others, and the Controls had 6.24 activities. The p of .79 shows a purely chance difference. Group II ($N = 40$ pairs) had a p of .9, indicating a purely chance difference between the Experimentals and Controls. (The Controls happen to have slightly more group activity.) For Group III ($N = 44$ pairs), the differences again are purely chance as is shown by a p of .9 (see Table 6).

(*b*). *Activity done alone.* Experimentals and Controls in Group I ($N = 25$ pairs) showed no differences at all with identical means of 5.24 activities done alone. Group II ($N = 40$ pairs) shows purely chance difference with a p of .9. (The Controls happen to have slightly more solitary activities.) Group III ($N = 44$ pairs) has a p of .63, also a purely chance difference (see Table 6).

(*c*). *Vigorous activities.* The Experimentals, Group I ($N = 25$ pairs) had a mean score of 4.2 vigorous activities and the Controls one of 4.32 activities with a p of .89, showing a purely chance difference. Group II ($N = 40$ pairs) shows no real difference with a p of .75; Group III ($N = 44$ pairs) similarly shows no real difference with a p of .56. The Controls in all three groups show a slightly more vigorous record (see Table 6).

(*d*). *Quiet activities.* The Experimentals, Group I ($N = 25$ pairs) had a mean of 11.0 quiet activities, Controls one of 10.16 activities. A p of .43 shows no significant difference. Group II ($N = 40$ pairs) shows no significant difference with a p of .36. Group III ($N = 44$ pairs) shows a purely chance difference as indicated by a p of .9 (see Table 6).

(*e*). *Total number of activities.* The Experimentals Group I ($N = 25$ pairs) checked a mean of 26.32 activities and the Controls 26.0 activities, showing a purely chance difference as indicated by a p of .9. Group II ($N = 40$ pairs) and Group III ($N = 44$ pairs) both show a purely chance difference as indicated by p's of .83 and .65 (see Table 6).

TABLE 10
PLAY ACTIVITY TOTAL

	Experimentals		Controls	
54-57			2	
50-53				
46-49				
42-45	1		1	
38-41	4		3	
34-37	5		1	
30-33	2		5	
26-29	8		7	$M = 26.14$
22-25	7	$M = 25.20$	7	$\sigma = 9.86$
18-21	9	$\sigma = 9.14$	11	
14-17	4		5	
10-13	1		2	
6- 9	3			
	$N = 44$		$N = 44$	

The record shows throughout, so far as this instrument can reveal the facts, that there is no difference whatever in the play activities of children related to whether they do or do not take music lessons.

(10). *Smalzried Social Acceptance Scale.*

(*a*). *Per cent of Judges per N in schoolroom.* The Experimentals, Group I ($N = 25$ pairs), with a mean score of 34 per cent of the children in their room noticing them, the Controls with 33 per cent showed a difference due to chance alone as indicated by a p of .9. Group II ($N = 39$

pairs) with a p of .14 and Group III ($N = 43$ pairs) with a p of .22, show differences approaching significance, suggesting that the children who take music lessons may be more of a factor in a schoolroom group (See Table 6).

(*b*). *Number of mentions per judge.* The Experimentals, Group I ($N = 25$ pairs) showed a mean score of 2.08 mentions by each judge who noticed them at all; the Controls, a mean of 1.92 mentions per judge. A p of .5 shows a difference which is not significant. Group II ($N = 39$ pairs) shows a chance difference indicated by a p of .75 as does Group III ($N = 43$ pairs) with a p of .9 (see Table 6).

(*c*). *Social acceptance score (median).* The Experimentals Group I ($N = 25$ pairs) with a mean social acceptance score of 5.53, and the Controls with a score of 5.44, show a purely chance difference as indicated by a p of .89. Group II ($N = 39$ pairs), shows no significant difference with a p of .49. The difference in Group III ($N = 43$ pairs) is one due entirely to chance as indicated by a p of .9 (see Table 6).

(*d*). *Spread of the mentions (Q).* The Experimentals, Group I ($N = 25$ pairs) have a mean Q of mentions of 1.83 scale points. The Controls have a mean Q of 1.64 scale points. The p of .49 indicates no significant difference. Group II ($N = 39$ pairs) with a p of .83 shows a chance difference and Group III ($N = 43$ pairs) with a p of .52 shows no significant difference (see Table 6).

(*e*). *Correspondence of the children's reputations in different groups.* Forty-five subjects received two or more ratings on the Smalzried Social Acceptance Scale by different groups of classmates. Correlations were computed between the scores and Q's yielded by different group ratings of the same child. The r was $+.45$ for the scores and $+.016$ for the Q's.[2] An r of $+.45$ suggests that a child has a distinctly different status in one group from that in another. The correlations should probably not be construed as measures of reliability inasmuch as the reliability of the scale should undoubtedly be tested in the same social grouping.

(11). *Rorschach: Harrower-Erickson Multiple Choice Group Test.*

(*a*). *Total choices: Answers which were underlined or checked.* The Experimentals, Group I ($N = 25$ pairs) had a mean number of underlined and checked answers of 50.12 and the Controls a mean number of 46.92. A p of .53 shows that the difference is not significant. Group II ($N = 40$ pairs) has a p of .85 which shows only chance differences as is true also in Group III ($N = 44$ pairs) with a p of .75 (see Table 6).

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[2] The Pearson product-moment coefficient of correlation was used.

(*b*). *Per cent of total poor choices.* The Experimentals, Group I ($N = 25$ pairs) had a mean per cent of 26 of the total choices which were poor and the Controls a per cent of 30 poor choices. A p of .39 shows a difference which is not significant. Group II ($N = 40$ pairs) has a p of .26 which is not a significant difference, but the p of .15 for Group III ($N = 44$ pairs) is possibly approaching significance. This decrease in the p with the larger sample may disclose a trend toward a significant difference. A larger sampling would be necessary before drawing definite conclusions about such a trend (see Table 6).

It is to be noted that the per cent of "poor" answers both for the Experimentals and the Controls falls in the normal undisturbed range according to Harrower-Erickson's definitions. Percentages between 40 and 60 she considers dubious, and percentages over 60 definitely disturbed.

(*c*). *Per cent of weighted poor choices: (Choices 6 and 7 scored .05, Choices 8 and 9 scored 1 and Choice 10 scored 2).* The Experimentals, Group I ($N = 25$ pairs) had a mean per cent of 25 weighted poor choices and the Controls a mean of 31 per cent. The p of .29 shows a difference which is not significant. A purely chance difference is revealed for Group II ($N = 40$ pairs) with a p of .61. Group III ($N = 44$ pairs) with a p of .38 shows no significant difference (see Table 6).

A high percentage of poor choices in the total answers to the descriptions of the inkblots possibly indicates that the subject who recorded the choices is a more disturbed person than the one who might record a low percentage of poor choices. In both the percentage of total poor and of weighted poor the Control subjects showed a slightly higher per cent of poor choices than the Experimentals, which may indicate that the Controls as a group are slightly less comfortable than the Experimentals as a group. The category "poor" includes popular responses from extremely disturbed persons, according to Harrower-Erickson (13). Failure to respond (No. 10, "Nothing at all") shows a strikingly higher incidence in a psychotic group than in "normal" adult and college-age groups. These findings led Harrower-Erickson to give the failure to respond item a weight of two when computing the percentage.

The fact that the significance of the difference fluctuates from a p of .29 to .61 to .38 as the number in the group increases from 25 pairs to 40 pairs to 44 pairs indicates clearly that it would be profitable to advance to an N of 100 or 200 pairs in order to determine whether the non-music lesson group is actually slightly less well adjusted (slightly more anxious or discouraged, etc.) than the group that takes music lessons.

(12). *Spencer experience appraisal; conflict score.*

(*a*). *General findings.* The Experimentals, Group I ($N = 17$ pairs)[3] had a mean conflict score of 51.65 and the Controls a mean score of 70.82 resulting in a p of .001 which is a highly significant difference. The p of .001 for Group III ($N = 31$ pairs) shows a highly significant difference (see Table 6).

The overwhelming and decisive difference in the Spencer Conflict Score shows that taking music lessons is associated with being in harmony with one's family and that not taking music lessons is apparently associated with being in a much more uncomfortable position of conflict with one's parents' ideals and actions, one's own ideals, and one's friends' behavior.

TABLE 11

SPENCER CONFLICT SCORES

	Experimentals		Controls	
199-207				
190-198	1			
181-189				
171-180				
162-170				
153-161			1	
144-152				
135-143				
126-134	1		3	
117-125	1		1	
108-116	1		1	
99-107	1		1	
90- 98	1		3	
81- 89	2		2	
72- 80	2		1	$M = 72.13$
63- 71	4		3	$\sigma = 37.66$
54- 62	2	$M = 61.29$	4	
45- 53	2	$\sigma = 40.05$	3	
36- 44	2			
27- 35	6		4	
18- 26	4		3	
9- 17	1		1	
	$N = 31$		$N = 31$	

In line with Dr. Marion Fitz-Simons (8) findings on parent-child relationships, it would appear that providing a child with music lessons is a warm and affectionate action of the parents as disclosed by these findings on the Spencer Conflict Score.

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[3] Note the changes in N. It will be recalled that the Spencer data from elementary school subjects were not used in calculating the p's. For that reason there are only two groups considered here, the group with mothers only being combined with the group having no parents.

It is interesting to note that although the popular conception of a child who takes music lessons might be that he is the victim of parental overdirection, these findings appear to indicate that exactly the opposite is the case; the child who is given music lessons apparently is typically the recipient of real regard from parents who are interested in his profiting by wider experiences and who will sacrifice things they might have wanted in order to provide something good for him.

(*b*). *Correlation of conflict score with score on Section G.* As a matter of interest, since the data were available in the present study, the experimenter explored the relationship between a child's total score on Section *G* (comparable to the popular "paper-and-pencil" personality tests) and the total Spencer Conflict Score.

In exploring the correlation between the conflict score and the score on Section *G* Spencer correlated the particular checking of each item by all his children with the conflict score yielded by that checking on that item. In this way, Spencer demonstrated an extremely low correlation between a child's statement about himself and the conflict between himself and the Fulcra of Conflict defined by Spencer, in the total group of boys and girls as being an r of only $+.30 \pm .05$.

The present procedure at least partially ignores Spencer's assertion that two individuals checking an item on Section *G* in a particular way may, as a matter of fact, be quite different individuals in their personality adjustment. Calculating a correlation between the two kinds of scores is perhaps merely exploring whether the conflict score as a screening device is something different from the Section *G* score as a screening device. Using the product-moment coefficient of correlation, an r of $+.75$ was obtained, indicating that a certain number of the same children would be located as disturbed children both by the conflict score and the Section *G* score, but that at the same time there would also be a number of children who would be differently rated by the two types of instruments.

So far as the use of the two instruments for individual diagnosis or individual guidance is concerned, an r of $+.75$ yields a coefficient of alienation of only .66,[4] indicating that the findings are 66 per cent pure chance, or in other words only 34 per cent better than pure chance. In other words, in the case of an individual, the conflict score may be a different measure from the Section *G* score, as Spencer contends.

(*c*). *ϵ^2 between conflict score and Rorschach per cent of weighted*

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[4] Formula for coefficient of alienation: $k = \sqrt{1 - r^2}$.

poor responses. Omitting the scores of the elementary school subjects, the ϵ^2 relationship between the Spencer Conflict Score and the per cent of weighted poor responses to the Rorschach slides of the remaining subjects ($N = 62$ children) was calculated (20). The resulting ϵ^2 of $+.209$, which is significant at the 5 per cent level, indicates a real correspondence between the two measures though they are not measuring exactly the same traits. An η corresponds roughly to a nonlinear correlation coefficient. The η here is .684. An r derived from the formula which pairs η^2 with r yields an r of $+.61 \pm .079$.

The ϵ^2 and the derived r indicate that the Rorschach Multiple-Choice Group Test and the Spencer Experience Appraisal are measuring related characteristics of the individual.

(13). *School teacher's rating of children (Graves Scale No. 7).* The original plan was to have three school teachers rate each child on his social status in the schoolroom. The returns on this Scale were incomplete in spite of all the experimenter's efforts and the teacher's wish to coöperate. Table 12 presents the number of teachers rating each pair of children, an Experimental and his matching Control.

TABLE 12
NUMBER OF TEACHERS SUBMITTING RATINGS

	Pairs	
Both E and C, 3 ratings	7	
Two ratings for 1 child and 3 for his paired case	10	
Both E and C, 2 ratings	10	
Pairs used		27
Three ratings paired with 1 or 0 ratings	4	
Two ratings paired with 1 or 0 ratings	9	
1 or 0 ratings paired with 1 or 0 ratings	4	
Pairs discarded		17
Total pairs		44

The combinations of three judges for each child in a pair, two judges for one child and three judges for the other in a pair, or two judges for each, were decided upon as probably sufficient to furnish some idea of what the teachers thought about these children with respect to their social status in the schoolroom. To have limited the data to the usually accepted minimum of three judges would have reduced the material to only seven pairs which would obviously have been too few to summarize. The scores from each teacher were averaged and differences ascertained by the t test. From an N of 27 pairs a p of .16 was found, showing a difference which is not significant but probably approaching significance.

Perhaps children who take music lessons are a more important factor in the schoolroom than those children who do not take lessons. A larger sampling of pairs should be investigated to determine the point.

If the Experimentals are somewhat better adjusted children, and if the Controls live in greater discomfort, as measured by the Spencer Conflict Score, it would suggest that the teacher in a schoolroom is responding to the greater harmony in the home of the music-lesson-taking child as evidenced by his seeming to her a "better" child in school.

(14). *Music teacher's appraisal of pupil (Graves Scale No. 1).* This Scale has eight items, the first four of which have to do with the music pupil's ability (Items 1 and 3) and his attitude toward music and practicing (Items 2 and 4). Items 5 to 8 are concerned with the parents' attitude toward music lessons. The returns on the last four items were incomplete because one of the music teachers was not in a position to know the parents well enough; therefore, Items 5 to 8 are not reported in the present study. Since the ratings are for Experimentals only there could of course be no comparison with the Controls.

(*a*). For those who might be interested, the mean rating score for both aspects of the Experimentals (Items 1-4) is 24.36 and the standard deviation 7.20.

(*b*). *ϵ^2 Between Conflict Score and music teacher's appraisal of child's attitude toward music (Graves Scale No. 1, Items 2 and 4).* An ϵ^2 of —.98 was found between Conflict Score and Music Teacher's Appraisal of Child's Attitude which would seem to indicate that there is practically no influence of one of these factors upon the other. ϵ^2 indicates whether any law connecting two variables exists; as ϵ^2 approaches 0 or becomes minus it means that no such law does exist. An η of .455 further bears out this finding since correlations roughly parallel η.

The reliability and validity of the Music Teacher's rating of the Child's Attitude toward Music are, unfortunately, not known in this study, therefore it is not certain whether there is no true relationship between a child's comfortable integration into his family group and his attitude toward music, or whether what the music teacher sees is different from the child's "true" attitude towards music thus masking a possibly real connection of some sort between a favorable conflict score and interest in music.

(15). *Comparison of high and low experimentals (as rated by the music teacher) and their matching controls.* At the beginning of this study two music teachers were asked to suggest names of pupils some of whom the teacher considered high in musical ability and some low in the same traits. On the basis of this first rough classification the entire group of 43 Experimentals was divided into high and low groups. (One of a pair of the original 44 pairs was incomplete, lacking the Spencer conflict measure.) (See Table 13.)

(*a*). *Mental Age.* The Experimentals ranked High ($N = 22$ single cases) had a mean mental age of 191.13 months (15 years, 11 months) and the Experimentals ranked Low ($N = 21$ single cases) had a mean mental age of 192.04 (16 years, 0 months). A p of .9 for the two groups shows that the differences are due to chance alone. The "High" Controls had a mean mental age of 184.95 months (15 years, 4 months) and the "Low" Controls one of 193.48 months (16 years, 1 month) with a p of .33. While this is not significant it is more nearly so than the p for the Experimentals. Evidently the matching on the High group is not as close as that on the Low group. There were several Experimentals who were so high in intelligence that it was difficult to find any non-music lesson child to match them and several had to be accepted who were lower than the Experimentals (see Table 13).

(*b*). *Seashore Pitch.* The High Experimentals ($N = 22$) had a mean score of 39.77 while the Low Experimentals ($N = 21$) one of 36.81, showing a p of .23 which is approaching significance. The "High" Controls had a p of .52 which is not significant. The "Low" Controls made slightly better scores than the "High" Controls (see Table 13).

(*c*). *Seashore Rhythm.* The High Experimentals ($N = 22$) made a mean score of 25.64 points and the Low Experimentals ($N = 21$) a mean score of 23.66. A p of .05 shows a significant difference. The "High" Controls ($N = 22$) with a mean of 24.09 and the "Low" Controls with a mean of 23.38 show a p of .19 which is surprising since the two groups of Controls are random samples with respect to factors identified with musical ability (see Table 13).

(*d*). *Seashore Tonal Memory.* The High Experimentals ($N = 22$) had a mean score of 26.27 and the Low Experimentals ($N = 21$) a mean score of 25.14 showing a p of .38 which may be approaching significance. The Control groups show a purely chance difference with a p of .9, and means of 22.41 and 22.24 (see Table 13).

(*e*). *Gaston Musicality (Pages 2 and 3).* The High Experimentals ($N = 22$) show a mean score of 47.82 and the Low Experimentals ($N = 21$) 42.43. The p of .058 shows a significant difference while the p of .9

TABLE 13

	Comparison of Experimentals Ranked High or Low by Music Teachers						Comparison of Matching Controls					
	High $N = 22$		Low $N = 21$				High $N = 22$		Low $N = 21$			
Measurement	M	σ	M	σ	t	p	M	σ	M	σ	t	p
Seashore Pitch	39.77	7.43	36.81	8.83	1.1945	.23	33.73	7.59	35.10	6.22	— .6457	.52
Rhythm	25.64	3.14	23.66	3.52	1.9501	.05	24.09	3.04	23.38	3.08	1.3216	.19
Tonal Memory	26.27	4.24	25.14	4.25	.8729	.38	22.41	5.45	22.24	6.47	.0934	.9
Gaston (Pages 2 and 3)	47.82	13.37	42.43	6.0	1.6923	.058	36.18	8.49	36.43	8.43	— .0968	.9
Social Acceptance Score	5.16	1.8	5.63	1.7	— .8803	.38	5.47	1.55	5.19	1.52	.5914	.55
	$N = 14$		$N = 16$				$N = 14$		$N = 16$			
Spencer Conflict Score	60.71	35.38	62.44	45.17	— .1151	.9	80.28	37.50	67.0	34.09	1.0162	.31

for the Control group indicates a purely chance difference, with means of 36.18 and 36.43 (see Table 13).

Whatever may be the explanation, the children whom the music teachers select as better musicians are substantially more able in "musicality" as measured by Gaston. It is interesting to consider whether there could be an innate difference in the "High" and "Low" children who are taking music lessons, thus accounting for their difference in the eyes of the music teacher, or whether the "High" children have somehow had a more favorable experience with music and thus have learned more about it.

(*f*). *Smalzried Social Acceptance Score.* The "High" Experimentals ($N = 22$) had a mean of 5.16 score points and the "Low" Experimentals ($N = 21$) one of 5.63 points. The p of .38 indicates a difference which is not significant. The same is true of the Control group with a p of .55 with means of 5.47 and 5.19 (see Table 13).

(*g*). *Spencer Conflict Score.* The "High" Experimentals ($N = 14$ omitting the elementary school subjects) had a mean conflict score of 60.71 while the "Low" Experimentals ($N = 16$) show a mean conflict score of 62.44. This is a purely chance difference as is shown by a p of .9. The Controls show a p of .31 with means of 80.28 and 67.00, which is surprisingly near to significance considering the fact that this is a random sample with respect to the factors being measured. (It is to be remembered that a higher conflict score is unfavorable.)

The equal comfort at home of the high and low Experimentals may seem to lend more support to the theory of a possibly innate difference between the high and low music-taking-children in "musicality."

(*h*). *Music teacher's appraisal of pupils' attitudes and ability (Graves Scale No. 1, Items 1-4).* As a check on the first rough classification of the Experimentals into High and Low with respect to musical ability the t test was used to find the differences between the music teachers' later ratings of the two groups on the Graves Scale No. 1 designed for this purpose. For the High group ($N = 22$) the mean rating was 26.77 and for the Low group ($N = 21$) the mean was 17.71. A p of .001 shows a highly significant difference. This would seem to indicate that the music teachers were consistent in their estimates of the child's music ability and his attitude toward music.

b. *Parents.*

(1). *Rorschach: Harrower-Erickson Multiple Choice Group Test.*

(*a*). *Total choices.* The fathers of Experimentals, Group I ($N =$

25 pairs) had a mean number of 57.04 total selections, and the fathers of the Controls had a mean of 48.12 selections. A *p* of .32 may be approaching significance. The mothers for Group I had a mean of 54.4 selections for the Experimentals and for the Controls a mean of 50.32 selections. The *p* of .47 is not indicative of a significant difference. The mothers of both Groups I and II ($N = 40$ pairs) had a *p* of .75 which shows a difference due largely to chance.

Harrower-Erickson suggests that the total number of items underlined and checked may be significant in some way, although the meaning of the number of items selected is not clear. Presumably an unusually small number means an anxious, withdrawing tendency whereas an usually large number may mean a compulsive attitude. At all events, whatever it may mean, there is no significant difference between the Experimental Control parents in the number of items they select.

(*b*). *Per cent of total poor choices.* The fathers of the Experimentals, Group I ($N = 25$ pairs) had a mean per cent of total poor choices of 34 and the fathers of the Controls, one of 38. The resulting *p* of .63 is not significant but it is interesting to note that the fathers of the Control group had a slightly higher percentage of poor responses. The mothers of Group I show a mean per cent of poor choices of 25 for the Experimentals and 30 for the Controls. The *p* of .28 may be approaching significance, as may the *p* of .16 for the mothers of both Groups I and II ($N = 40$ pairs). Here again the mothers of the Controls showed a slightly higher per cent of poor responses than the mothers of the Experimentals. The mothers show a greater difference than the fathers.

(*c*). *Per cent of weighted poor choices.* The fathers of the Experimentals, Group I ($N = 25$ pairs) had a mean per cent of weighted poor responses of 34 while the fathers of the Controls had a mean of 36 per cent. The *p* of .76 is not significant. The mothers of Group I showed a mean per cent of weighted poor responses of 21 for Experimentals and 25 for Controls. The *p* is .28 which may be approaching significance. For the larger group of mothers including Groups I and II ($N = 40$ pairs) there is a *p* of .15, with means of 21 per cent and 27 per cent of poor choices.

There appears to be an interesting trend in the returns from the mothers in both the per cent of total poor responses and in the per cent of weighted poor responses. The fathers show *p*'s of .63 and .76 while the mothers show *p*'s of .28 and .16, and for Group II of .28 and .15; the differences between the mothers of the Experimentals and of the Controls seem to be approaching significance. It may be noted also that the per cent of poor

TABLE 14

		Group I Male parents							Group I Female parents					
	Pairs	*E*		*C*				Pairs	*E*		*C*			
Measurement	N	M	σ	M	σ	t	p	N	M	σ	M	σ	t	p
Rorschach total choices	25	57.04	39.81	48.12	19.42	1.0068	.32	25	54.4	24.04	50.32	15.7	.7105	.47
Rorschach % total poor		.3396	.19	.3804	.39	— .4732	.63		.2532	.14	.3032	.18	—1.0784	.28
Rorschach % wt. poor		.3376	.28	.3676	.41	— .3033	.76		.2064	.12	25.40	.19	—1.0684	.28
Graves 6, Vocational Check List		5.24	1.64	4.40	1.66	1.8007	.055		5.40	2.69	3.68	2.43	2.3751	.018
Graves 4, Attitude toward Music Lessons Items 1, 2, 3, 4, 5, 7		44.20	7.12	40.28	11.34	1.4634	.15		45.36	5.51	42.48	7.35	1.3715	.17
Graves 4, Item 6 Child's satisfaction in playing		7.32	1.99	4.68	3.85	3.0448	.001		7.80	1.76	5.56	3.50	2.8596	.01
	Singles	$N = 22$		$N = 8$				Singles	$N = 23$		$N = 20$			
Graves 5, Childhood Experiences with Music Lessons. *Yes*	N 30	13.5	6.53	9.0	6.02	1.3224	.2	N 43	16.43	6.80	14.05	6.46	1.1724	.24
		$N = 3$		$N = 17$										
Graves 5, *No*	20	7.31	1.66	5.94	2.28	.9901	.32				Insufficient data			

TABLE 14 (*continued*)

		Groups I plus II Female parents					
	Pairs	*E*		*C*			
Measurement	*N*	*M*	σ	*M*	σ	*t*	*p*
Rorschach total choices	40	53.49	25.26	55.23	22.84	— .3191	.75
Rorschach % total poor		.2633	.15	.3178	.19	—1.4064	.16
Rorschach % wt. poor		.2115	.13	.2705	.20	—1.5659	.15
Graves 6, Vocacational Check List		5.03	2.86	3.63	2.49	2.3387	.019
Graves 4, Attitude toward Music Lessons Items 1, 2, 3, 4, 5, 7		46.50	5.15	43.78	7.18	1.9468	.05
Graves 4, Item 6 Child's satisfaction in playing		7.65	1.85	5.15	3.70	3.8196	.001
	Singles *N*	$N = 36$		$N = 32$			
Graves 5, Childhood Experiences with Music Lessons. *Yes*	68	16.72	4.94	14.00	6.56	1.9427	.05
		$N = 4$		$N = 8$			
Graves 5, *No*	12	8.25	1.51	7.75	1.83	.4681	.64

responses is higher for parents of Controls than for Experimentals in both of the poor response categories.

If larger samples disclosed a real difference between the mothers of the Experimentals and the mothers of the Controls in whatever phases of adjustment the group Rorschach is measuring, it would then seem that an opportunity to take music lessons is associated with having a more contented, well adjusted mother, regardless of the father's status. It is to be noted that the fathers both of the Experimentals and of the Controls show a higher percentage of "poor" responses than do the mothers.

The possibly real phenomenon of the Control mothers being less well adjusted than the Experimental mothers is to be remembered in connection with the striking fact that the Control children feel more conflict (in Spencer's definition) than do the Experimental children.

(*d*). *Joint returns, Rorschach per cent of weighted poor.* ϵ^2 between fathers and mothers of Group I ($N = 50$ pairs of parents, Experimentals and Controls combined) on the Rorschach per cent of weighted poor is —.478 which is not significant. ϵ^2 between all fathers and all children of

Group I ($N = 50$ father-child pairs) is —.366 which is not significant. ϵ^2 between all mothers of Groups I and II ($N = 80$ mother-child pairs) and all children in these Groups is .824 which is significant at the 1 per cent level.

So far as the Rorschach group test is concerned, the partners in a married couple do not have similar levels of adjustment. Also, fathers and children are randomly different in their adjustment levels. A striking fact emerges however in that the adjustment or lack of adjustment of mothers and children (including both sons and daughters) varies together.

(2). *Parent's attitude toward children's music lessons and performance: (Graves Scale No. 4, Total of Items 1, 2, 3, 4, 5, 7).* Item 6 in Parent's Attitude toward Children's Music has to do with the amount of satisfaction the child gains from playing. Had it been possible to find non-music-lesson children in sufficient numbers to match each Experimental this item would have been omitted entirely from the record of the parents of Controls. Since some children had to be included as controls, even though they had at some earlier time taken music lessons, the item about the Child's Satisfaction in Playing appears in the returns from the parents of the Controls. For that reason Item 6 has been calculated separately.

(*a*). *Parent's attitude toward music lessons (without Item 6):* The fathers of the Experimentals, Group I ($N = 25$ pairs) had a mean total response of 44.20 and the fathers of the Controls a mean of 40.28. A p of .15 may be approaching significance. The mothers of the same group showed a mean of 45.36 for Experimentals and 42.48 for Controls with a p of .17. The total group of mothers ($N = 40$ pairs) a significant difference between Experimentals and Controls as shown by a p of .05.

In other words, there is evidence here that the mothers of the Control children and possibly also their fathers do not "believe in" music lessons.

(*b*). *Satisfaction the child gains from playing: (Graves Scale No. 4, Item 6).* Since some of the parents of the Controls did not respond to this item the N is 19 pairs for Group I. The fathers of Experimentals had a mean of 7.32 while the fathers of Controls had one of 4.68. The p is .001 showing a highly significant difference which is to be expected. The mothers of Group I had a mean of 7.80 for the Experimentals and 5.56 for the Controls. A p of .01 indicates a highly significant difference as does a p of .001 for the larger group of mothers ($N = 34$ pairs).

An interesting suggestion comes up here as to how much the Controls may enjoy playing even though their parents say they do not. There is at least a suggestion that the children like to play, if they only had an adequate chance, inasmuch as they do play, some of them, in spite of not having lessons. Is it possible that the Control parents' ratings of the *child's* enjoyment in playing is actually an estimate of the *parents'* set against music or even their way of covering up an uneasy feeling at not providing lessons for their children? One Control child, with intense feelings, said to the experimenter: "Well, what if you wanted to take music lessons and never had a chance?"

(3). *Parents' childhood and present desires and experiences with music (Graves Scale No. 5).*

(*a*). *Parents who did not take music lessons.* In Group I only three Experimental fathers said that they had not had music lessons; 17 Control fathers said they had not taken music lessons. Of the combined Groups I and II only four Experimental mothers stated that they had not had music lessons; among the Controls eight mothers said that they had not taken music lessons.

The Experimental numbers are too small in each instance to permit an exploration of the difference between the Experimental and Control parents who did not have lessons as children.

It may be of interest to note that the mean score for 17 Control fathers, Group I, is 5.94 on the question of how much they wanted to take lessons and the mean of eight Control mothers in Groups I and II was 7.75.

(*b*). *Parents who took music lessons as children.* In Group I 22 fathers of Experimentals took music lessons as a child and eight fathers of Controls. The difference in actual numbers is not quite so striking with mothers, 23 Experimental mothers and 20 Control mothers in Group I took lessons and in the larger Group II 36 of the Experimentals and 32 of the Control mothers had lessons.

The fathers of the Experimentals had a mean score of 13.5 on the Graves Scale No. 5 while the Controls had a mean score of 9.0. This yields a p of .20. The mothers had a mean of 16.43 for Experimentals and 14.05 for Controls, with a p of .24. Both for the fathers and for the mothers in Group I, the difference between Experimentals and Controls may be approaching significance. The p of .05 for the larger group of mothers is significant.

In other words, among parents who had lessons as children the parents of children who are taking lessons express themselves as liking now and having in the past liked playing. The parents of the children who are not taking music lessons say that they do not now or did not as children like playing.

Among the Experimental Group I, 20 children had parents both of whom took music lessons as children while only eight of the Controls of Group I had both parents taking lessons as children. The critical ratio between these is 4.0 which is highly significant. In cases where the fathers of Experimentals took lessons and the mothers did not there is a critical ratio of 1.4 which is not significant. Fathers of Experimentals having no lessons and mothers having lessons show a critical ratio with Controls in the same category of 3.157 which is highly significant. Cases where neither parents took lessons as children have a critical ratio of 2.38 which is not significant. When one examines fathers regardless of mothers one finds a critical ratio between Experimentals and Controls of 5.1 which is highly significant. Mothers regardless of fathers have a critical ratio between Experimentals and Controls of 1.23 which is not significant. It appears that the most favorable condition for a child to receive lessons is for both parents to have had lessons, or from another point of view it appears that whether or not both parents have had lessons is apparently a crucial issue (see Table 15*a*).

TABLE 15*a*
PARENTS WHO TOOK MUSIC LESSONS AS CHILDREN

	Number		Percentages				Critical ratios of differences in percentages between *E* and *C* parents
	E	*C*	*E*		*C*		
			%	σ%	%	σ%	
Both parents took lessons	20	8	.80	.08	.32	.09	4
Male *Yes* Female *No*	2	0	.08	.054	.01	.02	1.4
Male *No* Female *Yes*	3	12	.12	.06	.48	.098	3.157
Neither	0	5	.01	.02	.20	.08	2.38
Males who took lessons	22	8	.88	.065	.32	.09	5.1
Males who did not take lessons	3	17	.12	.06	.68	.093	5.1
Females who took lessons	23	20	.92	.054	.80	.08	1.23

If one examines the question within the Experimental Group as to whether both parents having had lessons seems to be the determining factor the difference is found between that condition and each of the other three categories (father *yes* and mother *no;* father *no* and mother *yes;* both parents *no*) the critical ratios are 7.5, 6.8, and 9.6 and are highly significant. In other words, the distinctive background of a child taking lessons is that both parents have had lessons. By contrast among the Controls the condition of both parents having had lessons is not significantly different from any of the other possibilities except that there is a significant dearth of fathers with lessons and mothers without lessons as compared to both parents having had lessons (see Table 15*b*).

TABLE 15*b*

PARENTS WHO TOOK MUSIC LESSONS AS CHILDREN DIFFERENCES WITHIN *E* GROUP COMPARED WITH DIFFERENCES WITHIN THE *C* GROUP

	Number		Percentages				Critical Ratios	
	E	*C*	*E*		*C*		*E*	*C*
			%	σ%	%	σ%		
Both parents *Yes*	20	8	.80		.32			
With male *Yes*				.08		.09		
Female *No*	2	0	.08		.01			
				.054		.02	7.5	3.37
Both parents *Yes*	20	8	.80		.32			
With male *No*				.08		.09		
Female *Yes*	3	12	.12		.48			
				.06		.098	6.8	1.23
Both parents *Yes*	20	8	.80		.32			
With both				.08		.09		
Parents *No*	0	5	.01		.20			
				.02		.08	9.63	1.0

(4). *Vocational preference (Graves Scale No. 6).* Each parent was asked to (*a*) name his present occupation, (*b*) list the vocations in which he would be most interested if free to choose, and (*c*) list the things he wanted to do as an adolescent.

The reactions were scored three ways: (*a*) the list of desired occupations was scored plus if it contained the present occupation, (*b*) the list of desired occupations was scored plus for music if it contained a musical activity, and (*c*) the adolescent desires of the parents were scored plus for music if any musical activity appeared in the list.

(*a*). If the present occupation appeared in the list of the things he would like to do if he were free it seemed to imply that the parent is satisfied with his vocation and would therefore presumably be a more comfortable person to have for a parent than if the contrary were true. Counting the cases in which the present occupation is one of the desired occupations the Experimental fathers ($N = 25$) show this satisfaction with their present work in 96 per cent of the cases and the Control fathers in

88 per cent of the cases with a critical ratio of 1.14 which is not significant. The mothers of the Experimentals ($N = 40$) show 83 per cent in this category as against 65 per cent of the Control mothers which gives a critical ratio of 2.0 which is not significant but which is close to significance.

(*b*). The number of times music is mentioned in the list of things parents would like to do now was 12 per cent for Experimental fathers and 0 per cent for Control fathers, giving a critical ratio of 1.72 which is not significant. The mothers in the same classification show 25 per cent for Experimentals and 0 per cent for Controls yielding a critical ratio of 3.43 which is highly significant.

(*c*). In the matter of adolescent desires the Experimental fathers mentioned music 14 per cent of the time while the Control fathers only 8 per cent. This gives a critical ratio of .60 which is not significant. The mothers on the other hand show per cents of 48 Experimentals and the Controls 28 per cent. This yields a critical ratio of 1.9 which is not significant.

Although the fathers and mothers show no significant difference in their satisfaction with their present vocation it is to be noticed that both parents of the Controls are lower than both parents of the Experimentals. The Experimental parents show more desire to enter musical vocations than do the Control parents, especially the mothers. In the matter of adolescent desires with respect to music there are no significant differences but a little more tendency for the mothers of the Experimentals to have thought of music more than the mothers of the Controls.

B. Summary, Discussion, and Conclusions

1. *Summary*

1. *Group I.* Twenty-five children who take music lessons were matched with 25 others who do not take lessons in age, school grade, sex, and mental age. The parents of these children (25 pairs) as well as the children were given various tests.

Group II. Fifteen additional children were similarly matched with controls but it was possible to obtain tests of their mothers only, not of their fathers.

Group III. Four additional children taking music lessons were paired with controls but neither of their parents could be obtained for testing.

2. In the Seashore measurement of Pitch the Experimentals were significantly superior to the Controls.

3. In Seashore Rhythm the difference was only approaching significance.

TABLE 16

	Male and female parents' Group I													
	Experimentals							Controls						
	Pairs	Males		Females				Pairs	Males		Females			
	N	*M*	σ	*M*	σ	*t*	*p*	*N*	*M*	σ	*M*	σ	*t*	*p*
Rorschach total choices	25	57.04	39.81	54.4	26.55	.2758	.79	25	48.12	22.4	50.32	15.7	— .4019	.66
% total poor		.3396	.19	.2532	.14	1.8072	.055		.3804	.39	.3032	.18	.9033	.38
% wt. poor		.3376	.28	.2064	.12	2.1632	.03		.3676	.41	.2540	.19	1.2628	.22

TABLE 16 (*continued*)

		Total parents male and female					
		Group I					
		Experimentals		Controls			
	Pairs N	M	σ	M	σ	t	p
Rorschach total choices	50	55.72	33.52	49.22	17.52	1.2151	.22
% total poor		.2964	.35	.3418	.46	— .9239	.37
% wt. poor		.272	.222	.3108	.32	— .1408	.89

SUPPLEMENTAL TABLE

EXPERIMENTAL AND CONTROL SUBJECTS WITH FEMALE PARENTS' GROUPS I AND II

		Parents		Subjects			
	Pairs N	M	σ	M	σ	t	p
Rorschach wt. poor	80	.2410	.173	.2958	.249	1.6129	.11

4. In Seashore Tonal Memory the difference was again highly significant with the Experimentals superior.

5. In the Gaston Test of Musicality the difference was highly significant, the Experimentals being outstandingly more able than the Controls.

6. In the Gaston Attitude toward Music the difference was highly significant with the Experimentals showing more interest in music.

7. Children's Attitude toward Music (without reference to the child's belief concerning whether his parents want him to take lessons) shows a significantly more favorable attitude on the part of the Experimentals.

8. Children's Attitude toward Music, Including the Parents' Desire shows a difference only approaching significance.

9. With the exception of Play Activities which are Quiet, in which the Experimentals being more quiet is only approaching a significant difference, all other Play Activities, including group, vigorous, alone, and total checked show purely chance differences between the Experimentals and Controls.

10. In the matter of Social Acceptance the differences between the Experimentals and Controls seem largely due to chance. There is slightly more difference in the spread of scores and in the number of mentions per judge in a class for the Experimentals than for the Controls. The per cent of judges per room noticing the child is more favorable for the Experimentals as the number in the group increases, the difference approaching significance in Groups II and III.

TABLE 17

Comparison of Experimental and Control Groups Arranged in Order of the Significance of the Differences (the Order Has Been Determined by Group I Subjects)

Highly significant differences	Group I p Complete records E & C	Group I + II p Children's II records—mothers	Group I + II + III p Children's Records III complete—no parents
Spencer	.001		.001
Gaston, Page 1	.001	.001	.001
Gaston, Pages 2 & 3	.001	.001	.001
Seashore Pitch	.001	.001	.001
Seashore Tonal Memory	.01	.001	.001
Significant Difference			
Graves 2 and 3 with parents' item	.056	.13	.15
Approaching significance			
Graves 2 and 3 Omit parents	.23	.056	.054
Rorschach % wt. poor	.29	.61	.38
Rorschach % total poor	.39	.26	.15
P. A. Quiet	.43	.36	*.90
Seashore Rhythm	.49	.3	.18
S. A. *Q*	.49	.83	.52
No difference pure chance			
S. A. mentions per judge	.50	.75	.9
Rorschach total choices	.53	.85	.75
P. A. Group	.79	.9	.9
S. A. Score	.89	.49	.9
P. A. Vigorous	*89	*.75	*.56
P. A. Total	.9	.83	*.65
S. A. % Judges	.9	.14	.22
P. A. Alone	0	*.9	*.63

NOTE: All differences favorable to Experimentals except those marked with an *, in which case it is favorable to Controls.

11. In the Rorschach Multiple Choice test there are no differences of significance in the total choices, the Experimentals making slightly more choices than the Controls. In both the per cent of total poor and the per cent of weighted poor responses the differences are approaching significance. The Controls show higher percentage (unfavorable score) in these two tests in each of the three groups. Keeping in mind that a high per cent of poor responses is thought to indicate that more disturbance is present than if the per cent is low it would appear that the Controls appear as probably less comfortable than the Experimentals.

12. The Spencer Conflict Score shows a highly significant difference between the Experimentals and the Controls. In this case the high scores

(unfavorable scores) are made by the Controls. Keeping in mind that a high score presumably indicates the presence of emotional disturbance or conflict, the findings here seem to point to the fact that the Controls are very much more disturbed than the Experimentals.

13. The correlation of the Spencer Conflict Score with the score on Section *G* (comparable to the popular "paper-and-pencil" personality test) is +.75. This correlation indicates both some correspondence between the two measurements so far as estimates of groups of children are concerned and that the conflict score for use in individual prediction may be a different measure from the Section *G* score.

14. ϵ^2 between Spencer Conflict Score and Rorschach per cent of weighted poor is +.209 which is significant at the 5 per cent level. This would seem to indicate some correspondence between the two measures.

15. Either two or three teachers submitted ratings for each child for 27 pairs of children on the child's social status in his schoolroom. The difference between the rating of the Experimentals and Controls is possibly approaching significance, with the Experimentals being considered slightly better accepted than the Controls.

16. An ϵ^2 between the Conflict Score and the Music Teacher's Appraisal of the Pupil's Attitude toward Music is —.98 indicating that there is no law connecting these two variables.

17. In Mental Age there is a difference due to chance alone between the high and low Experimentals. The Controls show a difference which may be approaching significance.

18. The Experimentals were divided into a high and a low group (as ranked by the music teachers) and certain comparisons were made between them. The matching Controls were divided into parallel groups of "high" and "low."

In the Seashore Rhythm there is a significant difference between the high and low Experimentals, the better score being made by the high group. There is a difference approaching significance between the "high" and "low" Control group though this is a random sample with respect to the variable.

19. In the other three music tests, Gaston Musicality, Seashore Pitch, and Seashore Tonal Memory, there are differences approaching significance between the high and low Experimentals, the high group being in all three cases the more able. The differences betwen the "high" and "low" Controls are purely due to chance.

20. The Social Acceptance Score shows a difference possibly approaching significance with the low Experimentals slightly more accepted by their

TABLE 18

CHARACTERISTICS OF MALE AND FEMALE PARENTS' GROUP I AND FEMALE PARENTS' GROUPS I AND II GROUPED IN ORDER OF THE SIGNIFICANCE OF THE DIFFERENCE CLASSIFIED IN TERMS OF THE MALE PARENT

Highly significant	Group I Males	Group I Females	Groups I and II Females
Child's playing, Item 6 Attitude toward music Graves Scale, No. 4	.001	.01	.001
Significant			
Vocational preference Graves Scale, No. 6	.055	.018	.019
Approaching significance			
Attitude toward music Total Items 1, 2, 3, 4, 5, 7 Graves Scale, No. 4	.15	.17	.05
Experience with music lessons Graves Scale, No. 5—*Yes*	.2	.24	.05
Rorschach total choices	.32	.47	.75
Graves Scale, No. 5—*No*	.32	Insufficient data	.64
No difference			
Rorschach % total poor	*.63	*.28	*.16
Rorschach % wt. poor	*.73	*.28	*.15

*If Controls are higher than Experimentals see large Table 14 Summary.

TABLE 19

SOME CHARACTERISTICS OF HIGH COMPARED WITH LOW EXPERIMENTALS (AS RANKED BY MUSIC TEACHERS) AND TWO MATCHING CONTROL GROUPS ARRANGED IN ORDER OF THE SIGNIFICANCE OF DIFFERENCES, CLASSIFIED IN TERMS OF DIFFERENCES BETWEEN THE TWO EXPERIMENTAL GROUPS

Measurement	Experimentals High and Low *p*	Matching Controls *p*
Significant difference		
Seashore Rhythm	.05	.19
Approaching significance		
Gaston, Pages 2 and 3	.058	**.9
Seashore Pitch	.23	**.52
Seashore Tonal Memory	.38	.9
S. A. Score	*.38	.55
Pure chance		
No difference		
Spencer Conflict Score	.9	.31
MA	.9	.33

*Low experimentals superior.
**"Low" controls superior.

schoolmates than the high Experimentals. The Controls show even less difference in social acceptance between the two groups than the Experimentals, with the "low" Controls slightly superior.

21. The high and low Experimentals show a purely chance difference in the Spencer Conflict Score. The Controls show a difference which may be approaching significance.

22. The Music Teacher's Appraisal of the Pupils in Ability and Interest shows a highly significant difference between the high and low Experimentals. The high group was ranked substantially higher.

23. In the Rorschach Total Choice the fathers of the Experimentals were compared with the fathers of the Controls in Group I with a resulting difference possibly approaching significance. The Experimental and Control mothers, Group I, show slightly less difference than the fathers. The mothers of the larger group (I and II) show a difference largely due to chance. A difference possibly approaching significance is found when comparing all the parents of Experimentals with all the parents of the Controls.

24. In the Rorschach per cent of Total Poor the Experimental fathers and the Control fathers show a difference largely due to chance. The mothers of these children however show differences possibly approaching significance. The Experimental parents appear more comfortable in terms of this measure. The same differences are found in the responses to the Rorschach per cent of Weighted Poor, the fathers showing no significant difference but the mothers showing differences increasing in significance as the size of the group increases. The Experimentals in all cases have the more favorable per cents.

Mothers and fathers of the Experimentals Group I show a highly significant difference on both the per cent of Rorschach Total Poor and the per cent of Weighted Poor. The mothers and fathers of the Controls show a difference which may be only approaching significance while the differences between all parents in Group I are not significant.

25. ϵ^2 between fathers and mothers of Group I, both Experimental and Control, on the Rorschach per cent of Weighted Poor is not significant. ϵ^2 between all fathers and all children (Experimentals and Controls together) of Group I is not significant. ϵ^2 between all mothers of Groups I and II and all children in these groups is significant at the 1 per cent level.

26. In the Parents' Attitude toward Children's Music Lessons and Performance both the fathers and the mothers show a difference probably approaching significance as is the case with the mothers of Group I. The larger group of mothers (Groups I and II) show a difference which is highly significant between the Experimentals and Controls.

27. In the Parents' Estimate of the Satisfaction the Child Gains from Playing the difference is highly significant in all groups of parents, with the parents of the Experimentals estimating the child's joy in playing as much greater than the Control parents.

28. The number of Parents Who Did Not Take Music Lessons as Children was too small in the case of the Experimentals to permit a statistical summary of their reaction to the question as to whether they would have liked to take music lessons as children.

29. Concerning the occurrence of parents taking lessons as children, there is a highly significant difference between the Experimentals and Controls with respect to both parents having had lessons, that being the typical condition for Experimental parents and rare for Controls. Also there is a significant difference in occurrence of the combination of mothers having had lessons and fathers not having had lessons, the Controls showing this combination more frequently. The condition of both parents having been without lessons is also more frequent among the Controls showing a difference closely approaching significance.

30. The situation of fathers having had lessons regardless of whether mothers did or not appears more frequently among the Experimentals. The situation of mothers having had lessons regardless of whether or not the fathers did shows a highly significant difference favoring the Controls. It appears that the most favorable condition for children to have lessons is for both parents to have had lessons as children.

31. In Vocational Preference both fathers and mothers of Experimentals appear to be somewhat more satisfied with their present occupation than are the fathers and mothers of Controls but the difference is not significant. Among the mothers the Experimentals are more interested in music as adolescents but the difference may be due to chance. However, in present interest in music the Experimental mothers are significantly higher than the Control mothers.

2. *Discussion and Conclusions*

It seems difficult to believe that families had sorted themselves so definitely in terms of inborn musical aptitude that only children from such families and who also ranked high in musical aptitude were given music lessons. And so the question is raised as to whether these high musical scores may not be partly the result of experience with music. A later experiment of great interest might be conducted by giving the Control children a rich experience with music, then giving them the various tests to see whether they have improved.

The children who take music lessons are apparently following a family pattern in experience with music. This also suggests that the Experimentals' experience with music is much wider than just taking lessons, whereas the Control children have had very little or no experience with music in the home.

Findings on the Spencer Conflict Score that Experimentals and their parents are more in accord with each other seem to suggest very strongly that offering music lessons to the child is the result not only of the family pattern but also of a cordial feeling toward the child on the part of the parents.

There is enough in the present findings to indicate that a study of a child must include knowledge as complete as possible of the family he lives with, that is to say, his own parents. It is apparent also, as for instance in the data on parents taking music lessons themselves, that it is necessary to study both parents in order to understand the child. A study of mothers only in respect to parents who took music lessons would have shown no significant difference between the Experimentals and Controls.

Although the findings on the Rorschach Harrower-Erickson Multiple Choice Group Test do not reveal the statistical differences with this size group it is to be noted that both children's scores and the parents' scores show the Control families to be somewhat more emotionally disturbed. It appears in the present experiment that the Spencer Conflict Score is a more delicate instrument for detecting such disturbances as far as children are concerned.

Although the evidence in this experiment is not particularly clear there is at least a suggestion that the fathers and mothers of Controls are less satisfied with their present lot than the fathers and mothers of Experimentals.

It is perhaps interesting to note that music teachers' appraisal of music pupils' performance corresponds to the children's standing on the music tests used in this experiment.

There is nothing in this study to show that if the Control families started giving their children music lessons the general personal comfort of the whole family would improve. On the contrary general clinical findings would suggest that if some appropriate professional help could be supplied to the Control children and their families, as the family unit grew more comfortable the parents might spontaneously begin to give their children such advantages as music lessons.

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CRITICAL REVIEWS OF RECENT BOOKS

Journal of Genetic Psychology, 1947, **70**, 129-135.

(Harriman, P. L., Ed. Twentieth Century Psychology. New York: Philosophical Library, 1946. Pp. 712.)

REVIEWED BY RALPH W. ERICKSON

Twentieth Century Psychology, edited by P. L. Harriman, is a collection of 39 articles of which 25 are reprints of articles published between 1938 and 1943. The articles are divided into eight groups, of which six are grouped under General and Theoretical, nine under Social Psychology, three under Animal Psychology, six under Experimental Psychology, three under Psychology of Aesthetic Experience, six under Abnormal Psychology, five under Differential Psychology, and one under Child Psychology. There are no articles on Physiological Psychology, Industrial and Personnel Psychology, Educational Psychology, or the Testing Movement.

The first article is entitled *Psychology's Progress and the Armchair Taboo*, by D. B. Klein. This is an excellent protest against the totem of experimentalism with the restriction of the empirical approach to the laboratory. The article reminds one of the old claim that Americans are good experimenters, but it takes a European to grasp the theoretical implications of the experiments. In psychology this was particularly true, as it was not so long ago that even an interest in the history of psychology was looked upon with suspicion as indicating a philosophical bent. Klein traces the term armchair psychology to E. W. Scripture as a verbal thrust against Ladd, his senior at Yale, and points out that the taboo "functions as an obstacle to the advancement of our professional work." A distinction is drawn between empirical and experimental, and Darwin is indicated as a good example of an individual whose work was empirical rather than experimental. Similarly in psychology, William James, the armchair psychologist, was admitted by the devotees of experimentalism to be the greatest of American psychologists. In addition the two movements which have given the greatest impetus to modern psychology had non-experimental origins. Among others, Stout anticipated the central doctrine of the Gestalt movement, and psychoanalysis has always been empirical rather than experimental. For further examples the concept of social stereotypes and Maslow's work are cited as important armchair contributions. The time has come when we should know more philosophy, rather than worry about being called philosophers.

The second article is entitled *Nazi Science*, by D. P. Boder. The title is misleading as it is not a picture of science in Nazi Germany but an attack on the work of Erik Jaensch and the Marburg school of psychology. The propaganda tone of the article may be due to its original appearance in the Chicago Jewish Forum in 1942 at a time when emotions were being whipped up, but is out of place in a scientific treatise in 1946. Such words as dastardly, sadistic atrocities, diabolical, and the like do not give confidence in an impartial treatment. Jaensch's work on eidetic imagery is dismissed in one sentence, and the main part of the article is devoted to the personality studies with special reference to the book *Der Gegentypus*, published in 1938. Boder does not question the experiments which apparently established two types of people, an integrated constructive type, and an anti-social unstable type. His main objection is that while many Germans are placed in the latter group, the Jews are the main representatives. It is rather difficult to get the views of Jaensch on this point as Boder in three places uses "all the Jews," "*almost*" all the Jews, and "in a large compact mass." The differences are said to be biological, yet it is admitted that the unstable type can be changed to the integrated. Stripped of its propaganda, however, the article is suggestive. It would be interesting to use the tests of Jaensch on various persecuted groups, schizophrenic groups, and the like. In any case it would be very desirable to repeat the experiments with special reference to the Jewish problem by unbiased individuals (if such can be found), as there is at present much more heat than light.

The third article is *A Theory of Human Motivation*, by A. H. Maslow. This is an ingenious theory of motivations with emphasis upon goals rather than upon the drives themselves. The drives are organized into a hierarchy with the physiological needs at the bottom, then safety needs, the love needs, the esteem needs, and finally the need for self-actualization at the top. In general, the needs at the bottom tend to dominate behavior, but if they are satisfied remain quiescent, and higher needs emerge and become dominant until the top is reached. A complicating factor is the need to know or understand which appears to be outside the hierarchy. There are also preconditions or prerequisites for basic need satisfactions, such as the various freedoms, and there may be various exceptions to the hierarchy in some individuals, such as reversals, or emphasis or lack of emphasis on some drive. There may be only partial satisfactions of some needs, while there may be some activities not motivated by needs or by any motivation.

The next article, *The Conceptual Focus of Some Psychological Systems* by E. Brunswick, is an interesting attempt to outline early psychophysics, behaviorism, Gestalt psychology, introspectionism, and what he calls "Thing-constancy Research" in terms of a series of diagrams involving "longitudinal sequences of events."

C. O. Weber's article, *Theoretical and Experimental Difficulties with the Body-Mind Problem*, shows only too clearly that attempts to avoid dualism in psychology have not been successful. Weber first points out the hybrid character (mental and physical factors) of psychological laws and illustrates with examples from sensation, perception, memory, learning, and emotions. He also points out that attempts to avoid the mental aspect have always led to another type of dualism with subjective awareness smuggled in at some point. Next there is a brief history of the body-mind problem, followed by a discussion of the use of physiological psychology as a solution with special attention to Boring's concept of physical dimensions. Here he points out, as did the reviewer some years earlier, that a correlation between two variables does not give one variable, and that the cerebral processes that make possible the discrimination of colors are not the sensations themselves. There is also a discussion of C. C. Pratt's work, using an approach again somewhat similar to that used by the reviewer. Finally the attempts to use operationism and logical positivism are shown to be useless in obtaining a monism. The former merely entrenches the dualism in method (two types of operations—mental and physical), while the latter gives a dualism of physical and psychological sentences. The moral is that all attempts to obtain monism based on the denial or ignoring of facts are bound to be failures.

Isidor Chein's article, *Personality and Typology*, states that personality should not be classified under behavior phenomena nor under phenomena of awareness, but under the conditions of behavior and awareness. These conditions are environmental, physiological, and psychological. All of these are important in perpetuated motives which are the key to personality and in personality types. While no types are actually listed, various criteria are given and Freud's use of id, ego, and superego is given as in the right direction.

The section on Social Psychology begins with E. C. Tolman's *Identification and the Post-War World*. This is a plea for a World State and a statement of a psychological mechanism by which such a State would be accepted by the people. This is the use of group-identification strengthened with five characteristics: emphasis on common characteristics such as a World language and basic education, distinctive symbols and rituals, a common goal, a set-up which symbolizes family relationships, and common enemies such as disease, fire, or earthquake. Since this article was written the atomic bomb and other weapons have made a World State even more necessary. The question now is: shall it be on a Soviet dictatorship model, a democracy model, or is a compromise solution possible?

R. B. Cattell, in *The Concept of Social Status,* presents a scale of social status based on occupations. This is justified by a factorial study indicating that prestige is the best single measure of social status. H. Cantril, in *Identification with Social and Economic Class,* presents the results of a statistical study on how people rate themselves with regard to social and economic status. While most people identify themselves with the middle class, there is a tendency to regard their social class as higher than their economic group. Over one-fourth of those claiming to be in the upper social class earned less than $60 a week, evidently basing their claim on such criteria "as family connection, occupation, accomplishment, education, and the like."

N. C. Meier, G. H. Mennenga, and H. J. Stoltz present *An Experimental Approach to the Study of Mob Behavior.* This presents an artificial situation which approximates a real crime, and gives an opportunity to make a statistical study of motives leading to mob behavior. Results were obtained which tend to favor Allport's views as against those of Le Bon. A. Bavelas and K. Lewin present *Training in Democratic Leadership.* This article shows that unsatisfactory leaders in recreational work can be trained to be good leaders by pointing out the objectives of recreational work and changing their techniques. D. Starch presents *The 100 Greatest Books Selected by 100 Qualified Persons.* Some 25 of these were consistently ranked higher than the others, the Bible heading the list. *A Case Study in the Perpetuation of Error,* by G. W. Hartmann, throws considerable doubt on the story of the Black Hole of Calcutta. It reminds one of the propaganda used to justify our present treatment of the Germans.

Patterns of Aggressive Behavior in Experimentally Created "Social Climates," by K. Lewin, R. Lippitt, and R. K. White, gives a picture of boy club work with adult leaders using democratic methods (allowing the children to select their own activity under the guidance of the leader), authoritarian methods (all activities decided upon by the leader), and *Laissez-faire* (the children had complete freedom). The *Laissez-faire* groups were the most aggressive, with some of the authoritarian groups more aggressive and some less than the democratic groups. Explanations in terms of tension are made with regard to the authoritarian groups. *The Authoritarian Character Structure,* by A. H. Maslow, regards the authoritarian person as an insecure person living in a jungle where everyone is regarded as against everyone else. From this concept are deduced such traits as drive for power, hostility, hatred, prejudice, the identification of kindness with weakness, and the like. I don't believe the Russians would approve of this article, although much of the analysis of the insecure person is probably true.

The three articles on Animal Psychology are L. Carmichael's *The Experimental Embryology of Mind* and two articles by T. C. Schneirla: *Ant Learning as a Problem in Comparative Psychology,* and *Contemporary American Animal Psychology in Perspective.* The first is a discussion of the motor reactions, sensations, and needs or drives in fetal life based primarily on his experiments with the guinea pig. The second is a study of ant learning in mazes showing significant differences from rat learning in similar mazes. The third is a discussion of Animal Psychology between the World Wars showing the trend toward rat specialization, increasing anthropomorphism, and a subjectivism influenced by operationism.

The section on Experimental Psychology begins with an article by J. A. Bayton giving experimental results on *Interrelations Between Levels of Aspiration, Performance, and Estimates of Past Performance.* H. F. Brandt illustrates the use of eye photography in *Ocular Photography: A Scientific Approach to the Study of Human Behavior.* E. G. Wever, in *The Accoustic Characteristics of the Ear,* gives support to the theory that the transmission of impulses across the middle ear is "simple in character, like that of a columella." The muscles of the middle ear are regarded as protective, particularly against inner ear injury from excessive sounds, while distortions that produce overtones and combination tones are shown to be essentially a function of the cochlea. R. C. Davis, in *The Psychophysiology of Set,* discusses the experimental work on set as defined in terms of the reaction time experiment and the constant method. G. L. Freeman, in *The Physiological Conquest of Personality Structure,* presents the psychogalvanic reflex as a more refined method of personality assay than the grosser methods of the questionnaire and projective techniques. J. D. Harris, in *Recent Developments in Conditioning,* reviews the literature between 1939 and 1943.

M. Schoen begins the section on the Psychology of Aesthetic Experience with *Aesthetic Experiences in the Light of Current Psychology.* This article presents an ingenious theory of the aesthetic in contrast to the practical in terms of intrinsic values or meanings, and applies the concept in various fields of art and to various previous theories of beauty. M. G. Rigg, in *The Expression of Meanings,* shows experimentally that music by itself is unable to portray definite ideas but can portray some emotional moods such as joy and sorrow. C. P. Heinlein, in *The Affective Character of Music,* points out the relativity of emotional reactions to musical modes, depending upon the individual and the relations between the parts of the music.

Beginning the section on Abnormal Psychology, K. Dunlap, in *Toward a Practical Concept of Neurosis,* stresses among other characteristics the introspective tendency in the neuroses. R. M. Lindner, in *Psychopathy As a Psychological Problem,* states that we know practically nothing about the psychology of this condition. G. W. Kisker and G. W. Knox, in *Pharmacological Shock Therapy as a Psycho-Biological Problem,* discuss the use of insulin and metrazol, and consider various theories of the personality changes that occur. M. Brenman and M. M. Gill, in *Treatment of a Case of Anxiety Hysteria by an Hypnotic Technique Employing Psychoanalytic Principles,* show that the mechanism of transference can be combined with hypnotic treatment. M. H. Erickson and E. M. Erickson, in *Concerning the Nature and Character of Post-Hypnotic Behavior,* support the position that there is a spontaneous post-hypnotic trance. They also present evidence of advantages of reinducing the hypnotic state in this manner, and show the possibility of producing dissociation phenomena. P. L. Harriman, the Editor of the book, in *The Experimental Induction of a Multiple Personality,* illustrates the use of hypnotic or semi-hypnotic states in the production of personality alterations based on the personality structure of the individual.

H. G. Canady, in *The American Caste System and the Question of Negro Intelligence,* begins the section of Differential Psychology by pointing out that there is a correlation of +.18 between social status and psychological scores of negro students at West Virginia State College. From this and similar evidence it is deduced that the test performance is due to the social position which causes the intellectual inequalities. This article is undoubtedly the weakest in the book. For while the small differences and the select group make *any* deductions unreliable, the data can also be interpreted the other way round. At least with whites the tendency is to interpret the correlation of ability with position as a matter of the bright tending to improve their positions.

A. Roe and D. Shakow, in *The Effect of Mental Disorder on Intelligence,* point out the difficulty of testing mental patients, but attempt to present mean levels of various mental disorders. Psychoneurosis, manic depressive, catatonic dementia praecox, and paranoia are slightly above normal, the others ranging down to feeble-mindedness with paresis and hebephrenic dementia praecox the lowest of the psychoses. W. V. Bingham, in *The Army Personnel Classification System,* gives a brief summary of army procedures as of 1942. M. R. Hertz, in *The Rorschach Method and Its Significance in the Mental Hygiene Program*, presents claims of what the method can do without going into detail with regard to details of interpretation. Some of these details are presented by M. R. Harrower-Erickson in *The Patient and His Personality*, using Bruno Klopfer's scoring symbols. Illustrations of cerebral tumor and various neuroses are presented.

H. B. English, in *Trends in Child Psychology*, presents the only article in Child Psychology. This is a five-page summary of an article written in 1936.

While the omissions noted at the beginning of the review are the most serious faults in a work of this kind, some might also question the relative weights of the various sections. But on the whole, most of the articles were well chosen. All of them were well written, and it is possible that it is desirable to reflect the chaotic condition of racial psychology, which unfortunately still reflects more wishful thinking than true science. The typography of the book is very poor. On some pages there are as many as three errors, while a key diagram bears very little resemblance to the accompanying text. There is a two-page index.

Carleton College
Northfield, Minnesota

BOOKS RECENTLY RECEIVED

(There will always be two pages of book titles, listed in the order of receipt, i.e., the most recently received books will be found at the end of the list.)

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Child Behavior, Animal Behavior, and Comparative Psychology

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JUNE, 1947

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The Journal of Genetic Psychology, 1947, **70**, 141-154.

THE INFANT'S REACTION TO HIS MIRROR IMAGE*

Clinic of Child Development, Yale University

ARNOLD GESELL AND LOUISE B. AMES

A mirror helps the infant to reveal himself to himself. It also reveals much to the examiner who notes the reactions of the infant to the mirrored image. The mirror has been used routinely in the developmental examination of normal infants at the Yale Clinic of Child Development. The procedure and normative data have been partly summarized in *Infant Behavior: Its Genesis and Growth* (7, pp. 239-243); in *Psychology of Early Growth* (8, p. 52, 117); and in *Developmental Diagnosis* (6, p. 351).

The present study is based on a more rigorous analysis of the behavioral responses as recorded by cinema. Ten or more detailed cinema records were available at 12 lunar-month intervals from 16 through 60 weeks of age. In seven instances the same child was recorded throughout the entire age range. The records were analyzed by the method of cinemanalysis with the aid of an analytic viewer as described elsewhere (9, p. 410 ff.). Related stenographic records of numerous additional cases were consulted for supplementary data.

The observations of the mirror behavior were made with the aid of a clinical crib equipped with a plate glass mirror (18 inches x 24 inches). The mirror, fastened at the head of the crib, was covered by a roller shade. With a mildly playful approach the child was placed, in a free or supported sitting position, in front of the mirror. While the child's gaze was directed forward, the Examiner raised the roller shade, and the child was allowed full postural freedom in his reactions to the mirror image. Without attracting the child's attention, the Examiner later placed a small rubber ball beside the child.

The cinemanalysis disclosed some 60 behavior items, listed in Table 1. Percentage frequencies were computed to show the developmental trends. The trends are further summarized in a series of 12 composite age portraits. The infant's reactions at each age level are concretely described under six headings, namely: Key Behavior, Emotional Attitude, Regard Behavior, Arm and Hand Behavior, Body Postures and Movements, Foot Behaviors. This tabular conspectus permits both a cross-sectional and a longitudinal view of the data. By reading in age sequence the summaries of a given category (for

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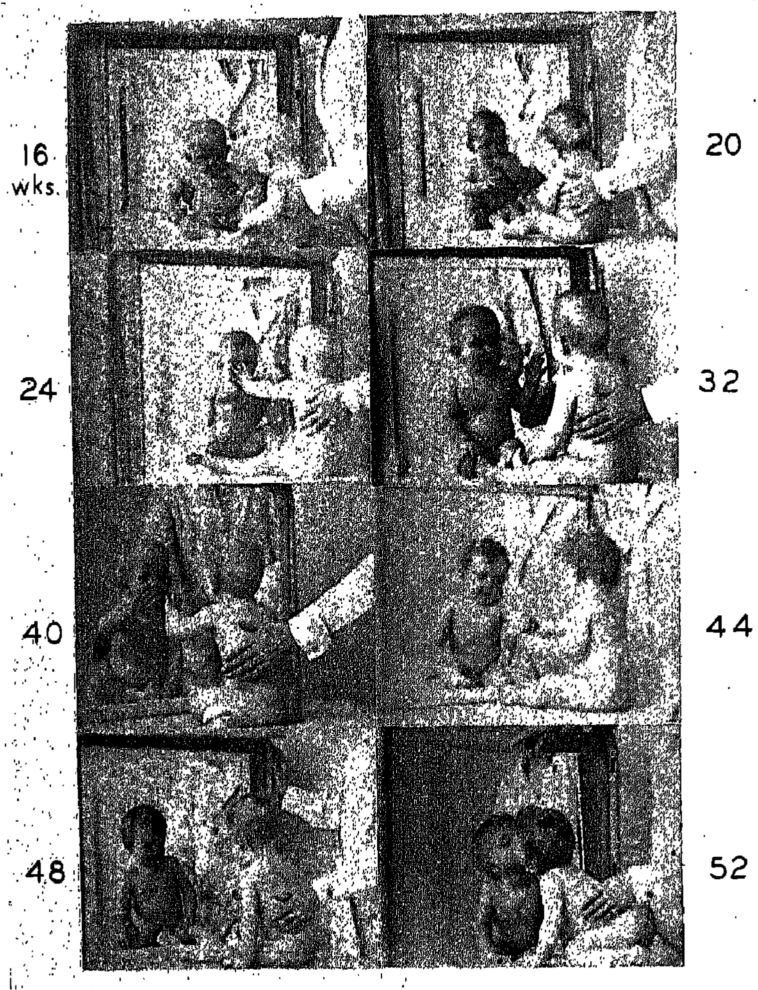

FIGURE 1
ILLUSTRATIVE REACTIONS AT 16, 20, 24, 32, 40, 44, 48, AND 52 WEEKS

example, *Regard Behavior*), the reader can trace the developmental flow for that particular field of behavior. The action photographs illustrate behavior characteristics of eight selected age periods.

COMPOSITE AGE SUMMARIES

16 weeks

Key Behavior: Chiefly regards reflection of own eyes or looks toward feet.

Emotional Attitude: Somewhat smiling.

Regard Behavior: Regard for reflection of own eyes predominates, though frequently head sags so that regard is directed toward feet. Eye movements are chiefly in a *vertical* plane,—from reflection of own eyes down to own feet. Child is fairly mobile in looking up and down in a median plane, straight ahead. Regard is for eyes or feet; little intermediate regard.

Arm and Hand Behavior: Arms are flexed, *hands remain immobile* near chest. Hands may activate slightly.

Body Postures and Movements: Sits slumped, very passive. Supported by adult hand. Arms flexed, hands near chest, may lift to shoulder height. Lack of mobility though hands may activate slightly. Head slumps.

Foot Behavior: Feet remain quiet though there may be considerable regard of foot, due largely to drooping posture of the head. May be very slight movement of foot.

20 weeks

Key Behavior: Regards image of own face, and hands activate. More mobility.

Emotional Attitude: Relatively less smiling than at 16 weeks. Several merely look steadily and somewhat inquiringly at reflection.

Regard Behavior: Eye movements chiefly as at 16 weeks, though regard may not get as far down as feet. Regard movements chiefly vertical, and higher than feet, due to better head control. May wander slightly from the vertical in a few cases who look at Examiner's image or look a little to one side.

Arm and Hand Behavior: Arms are flexed, somewhat actively. Hands are near upper chest or at mouth. Arms activate and there is some unilateral contact of mirror, mostly with fingertips.

Body Postures and Movements: Sits supported, less slumped than at 16 weeks. More mobile. Regard is chiefly higher than feet. Head movements continue predominantly vertical but there is a little head shaking. Hands activate.

Foot Behavior: No significant foot behaviors.

24 weeks

Key Behavior: Regards image of own face. Pats mirror and regards hand in contact. Feet to mirror. Body active. Regard more mobile. Nearly twice as many different salient items as earlier.

Emotional Attitude: Mood is becoming more smiling, and there is more vigor to body movements in general. (Smiling up till 40 weeks is chiefly at self.)

Regard Behavior: Beginning of a prominent tendency for *eyes to move up at an angle back and forth from* *own face image to image of Examiner's face.* Also regard moves from own face image, slightly down and horizontally to the image of hand contacting mirror. Many still have strong up and down vertical eye movements, from image of face to image of feet. Regards hands only as they contact mirror.

Arm and Hand Behavior: Hands when not actually moving may be held poised actively at about shoulder height. *All infants activate arms and nearly all touch the mirror, mostly patting it.* A few wave arms. A few move hand down length of mirror. Contact with mirror is chiefly unilateral, but in some is bilateral.

Body Postures and Movements: Sits supported. Leans way forward and may even bring face to near glass. Rocks body actively back and forth and may lose balance and fall backward and then regain balance. Feet mobile enough to contact mirror.

Foot Behavior: Feet are very active at this age and are usually brought into contact with the mirror. There may be regard for the foot as it remains in contact with the mirror.

28 weeks

Key Behavior: Behavior is becoming more patterned, inquisitive and investigative. Common pattern: fingers mirror regarding, then looks at once at own eyes reflected, and then up at Examiner's image. A little less total body activity than at 24 weeks: behavior becoming more refined.

Emotional Attitude: Mood is smiling, but chiefly inquisitive and investigatory. Initial soberness.

Regard Behavior: First strong age of *angle upward eye movements,* from image of face to image of Examiner's face. Vertical up and down movements, own eyes to feet, continue. Beginning of horizontal regard accompanied by head turning. Follows moving fingers on mirror. Also regards face image from close up to mirror as leans way forward. Several look away from the mirror and then look back suddenly as if *pouncing* with eyes on image. Definite and repeated patterns set up here, chiefly visual: hand out to touch mirror and regards this, then regard shifts to image of own eyes and then to image of Examiner. This is often repeated. Eye behavior experimental and inquisitive.

Arm and and Behavior: Hands and arms chiefly active. When resting may both be on floor, just outside feet. Nearly all contact mirror, but finger it gently and curiously, investigating, watching image of fingers. Place hand on mirror over face image, or trail hand down glass, regarding. Some pat floor. Strongest age for this.

Body Postures and Movements: Sits supported. Head movements no longer predominantly vertical. Many lean forward and bring face right up to near mirror. Beginning to grasp feet, or pat floor. Total body less active than at 24 weeks.

Foot Behavior: Feet are active at this age—toes flex and extend or foot moves about—though there is less contact with mirror than earlier. Infants are beginning to *grasp feet* and may do this in a pouncing fashion. Regard for foot and foot image is limited.

32 weeks

Key Behavior: A withdrawn, inactive age during which regard toward mirror predominates over contact. Most regard is directly forward though infant does for first time regard Examiner at one side. Regards image of different parts of body, out of contact with mirror. Appears to realize (?) that things he sees in mirror are part of him, as he moves hand, regarding its image.

Emotional Attitude: A withdrawn rather sober age, though child may smile after initial soberness. Less vigorous movement and less contact of mirror. Seems to be sensing what is being observed.

Regard Behavior: Again definite visual patterns set up: regards own facial image; Examiner's image; Examiner; then own face. Now horizontal visual behavior is quite as common as vertical. For the first time more than 50 per cent look around at Examiner. Angle regard back and forth from own image to Examiner's is very common. But regard for foot image is strong, giving vertical regard: from face down to feet. *More visual behavior than contact.* Most regard definitely forward. *Regards image of different parts of body (even of tongue) not in contact with mirror.* Hands and feet are particularly so regarded. Gazes at image of hands or feet and moves the member as watches image. Doesn't move it from place to place so much as (with hand) opening and closing fingers and rotating at wrist.

Arm and Hand Behavior: Hands are chiefly active, though when resting may both be on the platform, just outside the feet. Less contact with mirror, though may finger it lightly. Chiefly holds hand back from mirror and opens and closes or rotates it, not touching mirror but regarding image of this hand activity. Outstanding age for reaching toward mirror and then withdrawing hand without having touched mirror.

Body Postures and Movements: Sits with very slight support. Sits rather erect, not leaning forward, and looks forward with little hand or foot contact of mirror. Sits rather quiet, as regard behaviors predominate. Grasps feet but does not lean forward to do this. Head mobile enough now to turn toward Examiner at side.

Foot behavior: Considerable *regard of foot image,* foot out of contact with mirror. This is the *high point for grasp of foot*—many attempting to grasp toes by watching image only. Little foot to mirror behavior, but nearly half move toes or move foot about on platform. Several move toes and regard reflection of movement.

36 weeks

Key Behavior: Free and varied visual behavior: regards all surroundings, regards hand as it moves on glass, regards hand out of contact with mirror. Very vigorous: pats mirror, waves hands. Playful. Exploits rather than explores the situation. But poised even though hands are active.

Emotional Attitude: Playfulness is outstanding. Child exploits rather than explores the situation. A stage of poise and equilibrium. Marked smiling at self and beginning of smiling at Examiner's image.

Regard Behavior: By this age there is free and varied visual behavior. The child can and does exploit almost every aspect of the situation visually. For the first time regard for own image, Examiner's image, Examiner, and surroundings way around to one side all occur prominently. For the first time child moves hand around on glass, regarding as moves. For the first time over 50 per cent regard hand not in contact with glass as well as in contact. Conspicuous also is regard for hand held toward one side of mirror and then moving past edge of mirror, as if setting limits of the situation, visually.

Arm and Hand Behavior: Hands are active much of the time; when not active may rest on lower legs. Nearly all contact mirror with *playful active contact.* They exploit the glass manually. Whole hand flat palm contact, followed by finger tip contact. Both hands on mirror at shoulder height; but then asymmetric, one moving down across mirror to lower edge. May finger mirror frame. More patting than fingering. The high point for waving. *The high point for moving hand around the glass, regarding.* A few touch backs of hands to mirror, lift one hand in the other, or finger parts of body, as ear. May sit up, hands on lower legs. Some extend one hand to one side past mirror, and watch its reflection. Some experimentation with image of hand movement.

Body Postures and Movements: Sits nearly alone; Examiner's hand steadying back slightly. Hands when not active rest on lower legs. Head very mobile, regards Examiner at one side and surroundings at other. But body is poised and not active.

Foot Behavior: Feet are not active at this age, though in a few cases they may move about or touch mirror. Infant may regard the image of foot as it moves, out of contact with mirror.

40 weeks

Key Behavior: Chief behavior is regard for reflected movement. Very free regard to one side. Regard for hand and for hand image, both in and out of contact with mirror, is maximum at this age. Behavior less vigorous, and quietly experimental. Strong interest in sensing movements; and seems to take in more of the whole situation. Good postural control: can shift about on base, for instance, to a semi-kneeling position.

Emotional Attitude: Slow (though smiling) and deliberate behavior. Quiet experimentation. Seems to be sensing own large body movements. First age when over half smile at Examiner's image as well as at own image.

Regard Behavior: At this age *the outstanding regard behavior is regard for the reflection of movement* (his own or Examiner's.) This implies, of course, very flexible use of the eyes. Frequent quick shift of regard from hand on mirror to own face, as if to a point of reference. Some initial patterned regard for own hand image, own face image, Examiner's image. More free regard around horizontally, to Examiner or to surroundings at one side. This regard around to one side is so extensive that there is more regard for the ball (introduced first at this age) than at any other age in the first year. First strong age for regard of feet (not foot image).

Regard of hand, in contact or not in contact, and of hand image, in contact or not in contact, is maximum at this age. Regard for Examiner's image is less than usual.

Arm and Hand Behavior: Hands when inactive tend to rest on lower legs. Chief activity is slow and deliberate movement of one arm with regard for the reflected movement. Regards image of hand as it approaches mirror. May move hand horizontally toward mirror and then make a quick vertical stroke. Though all children do contact the mirror, there is only a small amount of contact, occurring when infant places both hands flat on mirror at shoulder level—almost a postural reaction. Many bring fingertips experimentally to the glass. Some move hand from place to place on mirror, regarding. . . . Odd bits of experimental hand behavior: finger own hand, clutch at mirror, pull hair regarding image.

Body Postures and Movements: Sits erect, alone, hands on lower legs. Moves arm deliberately, regarding reflected movement and seeming to sense movement. Also sways body back and forth, seeming to sense movement. Little manual contact with mirror except when leans forward both hands on mirror shoulder level, and peers at face.

Held less by mirror than formerly. Freer to turn head and upper trunk to look to either side. Body very active. Sways back and forth. Tilts head back, looking upward, as if experiencing neck sensations. One child even bends body low to one side. . . . Good postural control. Shifts about on base, as for instance to a semi-kneeling position.

Foot Behavior: Feet do not move actively at this age, but there is *more regard for the foot itself* (not its image) than at any age preceding.

Response to Ball: (Ball is introduced at this age for the first time. Placed on platform, to child's left and behind him, so that its image is reflected in the mirror.)

In turning to one side, more than half the subjects see the ball on the platform. They ignore the image of the ball.

44 weeks

Key Behavior: Regards image of withdrawing hand. Regard movements are slow and prolonged and mood is sober. Many different kinds of contact with mirror including poking. Much regard of persons: a high point for comparative regard of own and Examiner's images; and of Examiner and Examiner's image. The largest number of focal items occur at this age. Seems to experience sensations and to consider whole self.

Emotional Attitude: Behavior is sober and deliberate. Nearly all are sober initially, and there is less smiling than usual, though most become gradually more smiling as the situation proceeds. Regard is prolonged. Child continues to experience sensations.

Regard Behavior: At this age the outstanding regard behavior is *regard for image of withdrawing hand.* Watches image of waving hands. Regard goes horizontally from own image to Examiner's; from Examiner's image to Examiner; and up and down own body (image), after coming to rest on own hands which are on thighs. Regard

TABLE 1

BEHAVIOR TRENDS IN THE MIRROR SITUATION

Age in weeks	16	20	24	28	32	36	40	44	48	52	56	60
Regards image own face	**85%**	**100%**	**100%**	**100%**	**100%**	—	—	—	—	—	—	—
Regards image of Examiner	14	27	45	**80**	**87**	**75%**	**70%**	**100%**	**88%**	**80%**	**71%**	**100%**
Regards Examiner	14	9	9	20	**62**	**62**	**60**	**100**	**66**	**80**	**71**	**80**
Looks to one side	28	36	0	30	25	**50**	**70**	**100**	**55**	40	**57**	**80**
Looks from image to Ex's.	0	18	27	**70**	**74**	**87**	**50**	**87**	**77**	**80**	**71**	**100**
Looks from Ex's image to Ex.	0	0	0	0	25	37	20	**50**	44	20	28	20
Looks from own image to Ex.	14	0	9	10	25	12	30	25	22	40	42	**80**
Regards hand image												
Touching mirror	14	27	**81**	**90**	25	**62**	**80**	**100**	**55**	**90**	**85**	**60**
Not touching mirror	**14**	36	36	30	**87**	**75**	**80**	**50**	44	30	14	20
Regards hand												
In contact	14	27	**81**	**90**	25	**62**	**80**	**100**	**55**	**90**	**85**	**60**
Not in contact	0	18	18	20	12	**62**	**70**	**75**	**55**	30	42	20
Regards withdrawing hand	0	0	0	0	0	37	40	**75**	22	20	14	20
Regards foot image	14	18	36	20	**62**	37	0	**50**	33	0	28	40
Regards foot	42	18	27	20	25	25	**50**	25	22	0	14	**60**
Head movements predom. vert.	**85**	**81**	45	0	0	0	0	0	0	0	0	0
Shakes head	0	18	0	10	0	0	0	0	0	0	0	0
Tilts head backward	0	0	0	0	0	0	30	37	44	20	42	**60**
Hands activate	42	**81**	**100**	—	—	—						
Hands touch mirror	14	36	**90**	**90**	**62**	**87**	**100**	**100**	**77**	**90**	**100**	**100**
Pats mirror	0	0	**54**	40	37	**62**	**70**	**75**	**66**	**90**	**85**	**60**
Fingers mirror	14	18	36	40	**50**	37	**60**	**62**	44	**50**	**71**	**80**
Pokes mirror	0	0	0	0	0	0	0	**62**	33	20	42	40
Waves arms	0	18	36	40	12	**62**	20	**50**	11	30	28	0
Bats hands at mirror	0	9	18	30	37	12	10	0	0	**50**	42	20
Pats mirror as if in patacake	0	0	0	0	0	0	0	0	33	**50**	42	40
Trails hand down glass, regarding	0	0	18	40	0	0	0	37	0	10	**57**	40
Moves hand around glass, regarding	0	0	0	0	12	**50**	20	0	22	0	0	20
Hand to mirror over image of face	0	0	0	0	0	0	30	12	11	0	0	0
Pats floor	0	0	0	30	0	0	0	0	0	0	0	0
Fingers frame	0	0	0	0	0	37	30	25	33	40	0	20
Rotates hand	0	0	0	0	**50**	12	0	0	0	0	0	0

TABLE 1 (*continued*)

Age in weeks	16	20	24	28	32	36	40	44	48	52	56	60
Back of hand to glass	0	0	0	0	0	25	0	25	11	0	0	20
Holds hand palm up	0	0	0	0	0	0	0	0	11	0	14	0
Reaches toward glass without touch	0	36	18	20	**50**	0	30	25	33	30	14	0
Pounces with hand or eye	0	0	0	30	0	0	0	0	0	0	0	0
Grasps foot	0	0	0	30	**87**	0	0	**50**	11	10	28	20
Foot to mirror	14	0	**63**	20	12	25	0	0	44	0	0	40
Moves foot around	0	0	0	40	37	25	10	37	**55**	10	14	**80**
Sways back and forth	0	0	36	10	12	0	30	0	0	0	0	0
Face close to mirror	0	0	18	30	0	0	10	0	44	40	28	40
Face touches mirror	0	0	0	10	0	0	0	25	11	**60**	**57**	40
Kisses mirror	0	0	0	0	0	0	0	25	0	**50**	28	20
Sits up, hands on abdomen, regards self	0	0	0	0	0	0	0	37	11	0	0	20
Creep position	0	0	0	0	0	0	30	37	33	40	28	20
Climbs up against mirror	0	0	0	0	0	0	10	25	11	10	0	0
Sees ball image	0	0	0	0	0	0	20	37	11	10	14	40
Sees ball	0	0	0	0	0	0	**50**	37	44	20	**57**	**80**
Grasps ball	0	0	0	0	0	0	10	37	44	10	**57**	**80**
Ball to mirror	0	0	0	0	0	0	0	0	0	10	**57**	40
Smiles	**57**	**54**	**72**	**70**	**100**	**100**	**80**	**75**	**66**	**100**	**100**	**80**
At self	**57**	**54**	**63**	**70**	**87**	**100**	**80**	**75**	**55**	**100**	**100**	**80**
At Examiner's image	0	0	18	10	37	37	**60**	**62**	22	40	**57**	**60**
At Examiner	0	0	9	0	25	25	30	37	0	**60**	42	40
Vocalizes	0	9	45	—	—	—	—	—	—	—	—	—
Cries	0	0	9	0	12	12	0	0	44	30	14	0
Sober only at first	42	18	27	**50**	**50**	**62**	**50**	**87**	**55**	40	14	**100**
Definite patterns, non-social	0	0	0	**80**	**62**	0	0	0	0	0	0	0
Social patterns set up	0	0	0	0	0	0	0	0	0	20	**57**	20
Response chiefly social	0	0	0	0	0	0	0	0	0	**80**	**100**	40
Grimaces at image	0	0	0	30	12	0	0	37	11	10	0	0
Inquisitive or experimental behavior	0	0	0	**70**	**100**	37	**90**	**75**	**55**	10	14	**80**
Salient items	5	4	9	9	13	12	14	16	11	10	14	15

movements are slow and prolonged. Several regard Examiner first before regarding own image. This is the peak age for regard shifting directly from Examiner's image to Examiner as if comparing. Regard very horizontal. Regard is taking in more of the situation. Child sits up, hands on abdomen and *regards image of whole self.* Also this is the outstanding age, in first year, for regard taking in enough of whole situation to see ball image. . . . *Persons focus regard.* Only age when own image, Examiner's image, and Examiner all attract regard of all of subjects.

Arm and Hand Behavior: Resting hands are on thighs or abdomen. Much visual interest in withdrawing movements, after hand has contacted mirror. Some light waving of hands and watching the movement. Or may lean forward, both hands on glass. A unilateral age: one hand may be high on glass, other low, as in fingering toes.

At 36 weeks, the vigor of manual exploitation of the glass was outstanding. Here it is the *variety of kinds of manual contact with glass.* Child fingers mirror, pats mirror, and for the first time pokes mirror. Trails hand down glass. Back of hand to glass. Also brushes at or waves hand near mirror. Several move hand downward vertically with a sharp down-stroke. Hand movements more vertical than horizontal. Outstanding at this age is posture of hands on abdomen as child sits erect and regards whole image. Also child grasps own foot.

Body Postures and Movements: Less body movement. Sits erect, hands on thighs or abdomen; or leans forward, both hands on mirror, or face right up to mirror. Head tilting back is marked. May climb up on mirror, or resort to creep position. A high point for turning of head and upper trunk to one side or the other.

Foot Behavior: Much activity having to do with feet. Child grasps foot; moves foot about; and regards foot image. Does not bring foot to mirror and does not regard foot itself though may grasp toe and regard image of this. Some wiggle feet without appearing to notice this movement.

Response to Ball: Though one-third of children observe ball image, and one-third turn to one side and regard ball, only one child turns to the side to see ball on the clue of having observed the image. Those who turn to the side and see ball, grasp it.

48 weeks

Key Behavior: Regard focal toward mirror. Sober or crying mien and a lessening of contact. Hand movement very restrained but a high point for foot movement. Considerable postural activity; also face to near mirror and tilts head back to look upward. Considerable interest in the personal: spends much time regarding self, image of Examiner and Examiner.

Emotional Attitude: Sober or crying. The most crying and the least smiling of any age. Regard is prolonged and movements are slower and less excitable than formerly.

Regard Behavior. Regard more focally toward the front, especially toward mirror, than formerly. Regard more in the vertical plane, several regarding hand movements as hands move up mirror. Several also tilt head back and look way upward. Looking to one side has dropped sharply from 100 per cent to 55 per cent of cases.

Arm and Hand Behavior: Hands rest on thighs or abdomen. Hand movement very restrained. A low point for mirror contact. Many reach toward glass without touching it. A few pat mirror or move hand around glass regarding; fingertips or flat hand to mirror. A few hold hand palm up. Contact of mirror is not active; and child does not wave arms. Less hand movement and less interest in hand movement than formerly. Several bring hand against mirror fairly low and then consecutively higher and higher. Many finger frame.

Body Postures and Movements: Sits with regard more directly forward. Less hand movement but more foot movement. Many lean forward bringing face close to mirror; or lean forward and bring hands progressively higher on mirror. Marked tilting upward of head. Many turn into creep position and from creep position bring face right up against mirror.

Foot Behavior: A high point for foot movement, especially of toes; though hand movement is restrained. Toes move, feet move about on platform, and many bring foot to mirror. A little regard for foot and a little grasp of foot, though may regard foot image.

Response to Ball: Very few see ball image, but nearly half see and grasp ball as they turn to one side. At this age, several hold ball, regarding image, but do not bring ball to mirror.

52 weeks

Key Behavior: Behavior is extremely social and playful in a personal way. Regard is for faces. Even hand to mirror is personal, as if playing pat-a-cake. Feet out of the picture and hands are in. Leans forward till face touches mirror and also kisses mirror. Seems to see whole image, not body parts. Parts seem to have become integrated into a total social self.

Emotional Attitude: Extremely smiling, social and playful. All smile at own image, and first time that over half smile at Examiner as well as at Examiner's image. Hand behavior social and vigorous.

Regard Behavior: Regard chiefly frontward to mirror and chiefly picks out faces: image of own face, image of Examiner's face, or Examiner's face. Regard may go sideways as regards Examiner. Long social regard for some one thing at a time—not much shift. Regards hand as it touches glass but not image of hand when it is not on glass, nor image of moving hand.

Arm and Hand Behavior: Hand behavior social and vigorous. Pats mirror as if playing pat-a-cake, with one or both hands. (Not as formerly as if finding out about his body.) Pats or bats at mirror, and also some waving of arms. Hands are used as part of social situation, not as body parts important in themselves. May lean forward, hands against mirror; or leans forward onto hands in creep position.

Body Postures and Movements: The high point for leaning forward and bringing face up to or even kissing mirror. Or leans forward and appears to play pat-a-cake with mirror. Many drop way forward into creep position and may then bring face right up to mirror. Tilting head back and looking upward is not prominent at this age and there is less regard to one side.

Foot Behavior: Foot behavior and regard for foot are very limited and inconspicuous at this age.

Response to Ball: Behavior is extremely personal and there is minimal response to the ball, though one child reaches into mirror for ball.

56 weeks

Key Behavior: Behavior quite similar to that at 52 weeks. Child sets up repeated visual-social patterns, approaching or withdrawing from image with face or hands. Social behavior toward own image, and playful hand behavior. Regard for moving hand. Active contact of hand with mirror; even strikes at mirror. Also face to mirror. Postural activity.

Emotional Attitude: Playful, sportive and social. Rhythmic social games. A peak of smiling at self, Examiner, Examiner's image. An all-time low for initial soberness. Active vigorous social hand and arm behaviors.

Regard Behavior: Much the same as at 52 weeks—chiefly forward prolonged regard for image of own or Examiner's face. More sideward glances, just to one side or way around to regard ball. Also regards image of approaching hand or face. First age when over half trail hand down mirror, regarding. Repeated social patterns—partly visual—are set up.

Arm and Hand Behavior: Patterned social games. Approaches and withdraws from mirror with hands or face. Hand behavior sportive, playful, and active. Pats hand or mirror as if in pat-a-cake. Waves hands, strikes hands at mirror, fingers, pokes, pushes open hand against mirror. May hold hand palm upward. Trails hand down glass, regarding. . . . Posturally may use hands in climbing up by mirror; or may kneel, one hand on floor, one on mirror.

Body Postures and Movements: Sets up social game in which he approaches and withdraws from mirror with hands or face, involving some backward and forward swaying of whole body. Many lean forward, bringing face right up to mirror. Others assume creep position and then place one hand on mirror, bringing face right up to mirror. Some climb to kneeling by mirror. Again there occurs backward tilting of head.

Foot Behavior: Foot behavior and regard for foot very limited and inconspicuous.

Response to Ball: Very few observe ball image, though one while regarding ball image grasps ball itself, without turning. Over half observe ball as they turn; grasp it and bring it to the mirror.

60 weeks

Key Behavior: Less social behavior and prolonged concentration on own face image. Looking from own image to Examiner's, or from own image to Examiner, is strong. Return to earlier behaviors, as considerable experimental fingering of mirror. Much vertical regard, from face image down to feet; and much horizontal, around to one side. Feet to mirror.

Emotional Attitude: Behavior is largely sober and intent. Much less social. All are sober at first though all but one later smile restrainedly. Prolonged regard for face. Seem to be sizing up the situation.

Regard Behavior: Most regard for faces. Long regard for own face as if looking at a person. Much regard from image of own face to image of Examiner's; or from image of own face to Examiner. Only age when this latter occurs in over half the cases. Considerable sideward regard: 80 per cent turn and see ball. Nearly half, for the first time, see ball image in mirror and then turn and grasp ball. Regard also travels vertically at this age—down to feet or feet image. First time foot regard has been strong since 40 weeks. A strong age for continuing vertical regard by tilting head back and looking overhead. . . . Some move hand around glass or trail hand down glass, regarding. Many behaviors typical of earlier ages come in here.

Arm and Hand Behavior: Hand behavior no longer social but somewhat experimental as earlier. No arm waving, but pats and fingers mirror experimentally. Also moves fingertips around on mirror, watching them. Hand movement active but not vigorous.

Body Postures and Movements: Less shift from sitting to other postures. Many lean forward and contact mirror with hand/or face, then sit back as if sizing up the situation. Eye movements, with some head movement, up and down own image from head to foot; also sideways. But much regard of own face. Feet active. Whole body very mobile in leaning back and forth and in turning to side, but postural activity now is used as a means rather than as an end in itself.

Foot Behavior: Foot behavior again very prominent, as at 48 weeks. Feet very active in rotating at ankle, moving about mirror or coming against glass. There is also marked regard for foot and for foot image.

Response to Ball: Behavior is less social and more attention to objects. Nearly half note image of ball, then turn and grasp ball and bring it to the mirror.

COMMENT

A longitudinal survey of the foregoing data brings to light significant ontogenetic trends. The scope of the infant's responses expands with advancing age. At 16 weeks his reaction is largely limited to his eyes. In due course, arms, hands, feet, fingers, toes, and tongue are activated by sight of the image and participate in his responses. The area of the regard similarly expands from a narrow fixation of the face to inspection of the total body image and surroundings. Toward the end of the year there is increasing perception of depth and distance, and a growing social awareness. The patterns of manipulation and exploitation show a progression from gross to finer, elaborated coördinations.

These progressions do not pursue a straightline course. In the age period from 24 to 60 weeks it is possible to distinguish a half dozen phases in which patting of the mirror gives way to fingering which in turn gives way to patting and then again to fingering. Similar fluctuations occur in smiling and sobering, and also in the relative predominance of hand versus foot activity. Other fluctuations and alternations concern the focus of regard and of manipulation. The following sequence came into evidence in relation to the still hand, the moving hand, the still foot, and the moving foot: (*a*) regard on contact; (*b*) regard of image without contact; (*c*) regard of member without contact.

These behavior trends are too consistent to be fortuitous. They reflect the developmental factors which underly the mechanism of reciprocal interweaving.

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THE DEVELOPMENT OF HANDEDNESS

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A. INTRODUCTORY

The problem of handedness has been somewhat oversimplified by the literature. There has been a tendency to regard handedness as a specific trait comparable to eye color or skin pattern. It has been too freely assumed that a child is either right handed or left handed, once and for all.

The present study assumes that handedness is an extremely complex trait which is intricately bound up with the total action system of the child. Accordingly, it becomes important to inquire into the various developmental expressions of laterality, and to approach the whole subject from the standpoint of ontogenetic patterning and organization.

A few investigators have already noted that the acquisition of lateral dominance does not take a straight line course. Giesecke, in particular, found "evidence of transfers in dominance in the individual developmental history, apparently occurring at fairly definite age levels, noticeably during the seventh month of age and again at the ten-months age level" (13). Lesné and Peycelon found that the normal infant goes through a short phase of "ambidexterity" between the fifth and ninth month, prior to the establishment of unidexterity by 10 or 11 months (14). Lederer likewise observed shifts with temporary periods of dominance of the left hand during the first year of life (15).

If such shifts occur, when do they take place; and what is the developmental rationale of the shifts? When do the manifestations of handedness become predictive? How do individual as well as maturity differences express themselves? A complete answer to such questions would entail a comprehensive study of laterality in all its aspects—postural asymmetry, eyedness and footedness as well as hand preferences. Much information, however, can be gained from an analysis of the hand posturings and the hand movements of children under the standardized conditions of a developmental examination of behavior. Extensive cinema and stenographic records of the Yale Clinic of Child Development supply the basic data of the present study.

B. Subjects and Data

The subjects included normal infants, preschool children, and school children ranging from 8 weeks to 10 years of age. During the first five years of life these subjects were given the systematic Yale developmental examination as described elsewhere (6, 7). From 5 to 10 years of age, test situations were instituted to secure responses to cube, pencil and paper, and free construction situations. At all ages the responses were recorded both stenographically and by cinema. During the first 60 weeks of life, records were made at lunar-month intervals. Thereafter, the records were made at 80 weeks and annually from 2 through 10 years of age. Seven cases, to be designated as basic cases, were documented through the entire age period. In an additional case, daily cinema records were made throughout most of the first year. The total number of cases analyzed at any given age level varied from 12 to 45.

During the first 32 weeks, the subjects were photographed in the supine position as part of the routine examination. The subjects also reacted in the sitting position to the stimulus objects. Test objects were presented in accordance with a standardized procedure which afforded a high degree of experimental control. Objects were generally presented in the mid-line.

In the course of time, we found that the age of 2½ years was of special interest from the standpoint of laterality. Developmental examinations had not been given to the basic cinema cases at that age. This deficit was partly corrected by supplementary observations and stenographic records of the behavior of a group of guidance nursery children who were routinely examined at the age of 2½. All the photographic records were studied in detail by the method of cinemanalysis described elsewhere (2, 3). Two types of analysis were employed: (*a*) quantitative, (*b*) descriptive. Heavy reliance was placed on the descriptive narrative type of analysis. The quantitative analysis provided percentages for the following data: (*a*) Total time spent in right handed, left handed, and bilateral contact of stimulus object at each age level, both in supine and sitting positions. (*b*) The percentage of time in which the subject while supine maintained a left tonic neck reflex position, a right tonic neck reflex position, or bilateral postures.

The detailed descriptive analysis was concerned with the actual flow of the manual behavior, taking note of all of the shifts or changes of handedness which took place within a given test situation and within the examination as a whole. These descriptive protocols formed the basis of tables and graphs which presently appear.

C. DEVELOPMENTAL SHIFTS IN HANDEDNESS

Detailed cinemanalysis of the manual responses of children developmentally examined between 16 weeks and 10 years of age reveals that even in those children who eventually establish clearcut right handedness there occur marked shifts in handedness from age to age, particularly in the first year of life. Contact and manipulation of objects tend to be first with the non-dominant hand, then bilateral, then with the dominant hand alone, once again bilateral, then with one hand, usually and increasingly the dominant. At 1½ years in many children there comes a period of marked bilaterality, followed by definite use of dominant hand alone at two years. Considerable bilaterality is again manifested from 2½ to 3½ years. From four years on, the dominant hand is used mostly, but in some cases even at seven years there is a transient period of use of the non-dominant hand or of both hands together.

Table 1 presents in schematic chronology the characteristic age shifts in the handedness of subjects all of whom eventually showed definite, clearcut right handedness. Figure 1 illustrates these shifts as they were observed in the seven basic cases for whom detailed cinema records were available through the first 10 years, and in one additional case, through the first two years. The graph (Figure 1) plots the number of cases at each age level in whom right handed, left handed, or bilateral behavior occurred predominantly or very conspicuously at each monthly age level up to 60 weeks of age, and

TABLE 1
SCHEMATIC SEQUENCE OF MAJOR FORMS OF HANDEDNESS

16-20 weeks: Contact unilateral and, in general, tends to be *with left hand.*
24 weeks: A definite shift to *bilaterality.*
28 weeks: Shift to unilateral and oftenest *right hand is used.*
32 weeks: Shift again to *bilateral.*
36 weeks: Bilaterality dropping out and unilaterality coming in. Behavior usually characterized "right or left". *Left predominates in the majority.*
40-44 weeks: Same type of behavior, unilateral, "right or left", but now right *predominates in the majority.*
48 weeks: In some *a temporary, and in many a last shift, to use of left hand*—as well as use of right—either used unilaterally.
52-56 weeks: Shift to clear unilateral dominance of *right hand.*
80 weeks: Shift from rather clearcut unilateral behavior to *marked, inter-changeable confusion. Much bilateral, and use of non-dominant hand.*
2 years: Relatively clearcut unilateral use of *right hand.*
2½-3½ years: Marked shift to *bilaterality.*
4-6 years: Unilateral, *right-handed* behavior predominates.
7 years: Last period when *left hand, or even both hands bilaterally,* are used.
8 years ff: *Unilateral right* once more.

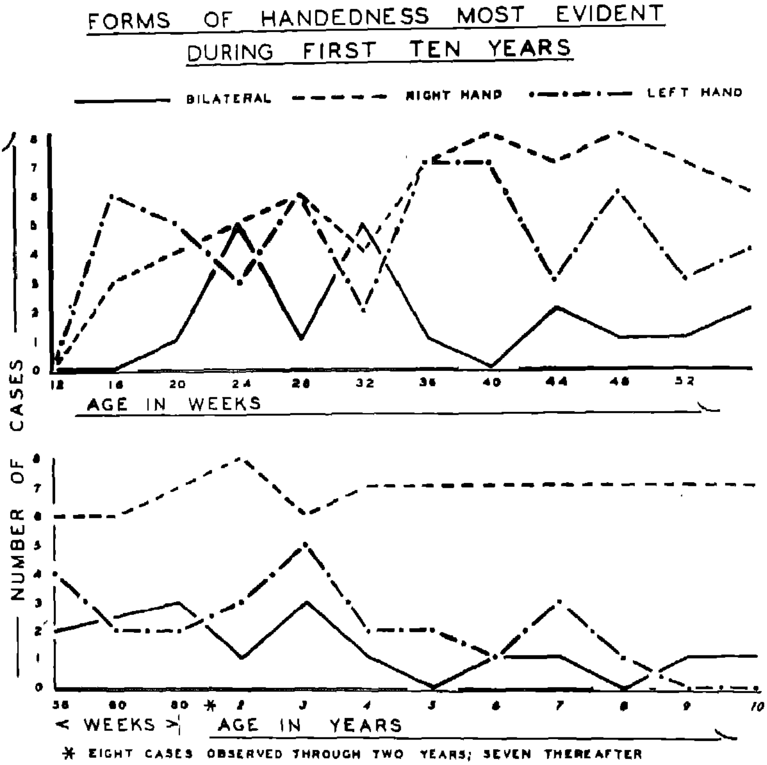

FIGURE 1

at yearly age levels from 2 to 10 years. The totals indicated on the graph are frequently more than eight, because some cases definitely exhibited more than one type of handedness at a given age.

A tabular summary (Table 2) describes in detail the child's manual responses to stimulus objects in the examination situation at advancing ages.

D. Individual Fluctuations in Handedness

Although Table 1 gives a fair indication of age sequences in the development of handedness patterns, it does not do justice to individual differences and to the fluctuations which occur in a single individual in the course of a behavior examination.

Such fluctuations are more frequent at some ages than at others, and they also tend to occur with some consistency in relation to specific stimu-

TABLE 2

Age Trends in Handedness*

12 weeks

Behavior rather variable. Postures chiefly bilateral though nearly all subjects still show traces of the t. n. r. On sight of stimulus object, both arms may activate somewhat alternately, or one arm at a time may activate. *No contact of object.*

16 weeks

Posture, activity and contact (when it occurs) are chiefly *unilateral.* Most of the children sit in a *left t. n. r. and the left arm is the more active,* the more advanced in manner of activity, and the most likely to contact the object. Most children slump most frequently toward the side of the extended arm. The flexed t. n. r. arm may be active in a gross, crude manner. Body posture may bring this arm nearer the stimulus object and thus bring about contact of object with the right hand.

Variable factors: There occurs a shift of handedness apparently determined by the place in the examination at which the response occurs. *Several of the subjects show a marked change of laterality (possibly a retreat) about halfway through the examination.* This shift often occurs with the cup or the bell and once it occurs it is usually maintained. The size and shape of the stimulus object seem also to influence the response. Very small objects, as the pellet, do not cause arm activation even though they attract regard. Also though behavior is mostly unilateral, large objects as cup and formboard or a tall object such as the bell, usually cause a shift from the initial handedness preference.

20 weeks

For the most part both activity and contact are *unilateral.* Child may sit in left t. n. r.; or may sit in unilateral posture with passive hand near table edge or even down beside the trunk. Even when both arms activate at once, one is more active and contacts the object. In nearly half the children nearly all contact and grasp are, throughout, with the same one hand.

Variable factors: There is no shift of handedness within the examination at this age which seems due either to place in examination or size or shape of stimulus object.

24 weeks

This is a rather *bilateral* age. In about half the cases behavior is predominantly bilateral even to the extent of bilateral approach and

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*It should be kept in mind that of the seven main cases observed, six establish later right-handedness. One uses right hand or both hands together. None is left-handed. Behavior as here described is that observed while subjects were in the seated position.

TABLE 2 (*continued*)

contact of object, though often the dominant hand tends to reach the object a little the sooner. Only two children have definitely unilateral behavior with non-dominant arm remaining for the most part passively down beside the body. There is, in this group, more use of right hand alone than of left. There is usually a differential use of the two hands. Child usually holds only one object at a time. There occur *the beginnings of transfer*: an awkward two-stage transfer involving a mid-stage of bilateral holding.

Variable factors: There is no marked shift within the examination though cup and formboard seem to attract more bilateral behavior than do other objects. Also if an object is hard to reach or hard to grasp, behavior tends to become bilateral.

28 weeks

Behavior at this age is highly complex and extremely variable. Nearly every child uses some right, some left and some bilateral though there is *more unilateral than bilateral behavior.* There is in nearly every case a dominant hand; and there is usually a differential use of the two hands whether they are used independently or together. The dominant hand performs in a more advanced manner. When the dominant hand makes the initial approach it is used for some time alone. When the non-dominant hand is used, the dominant hand is held ready, quickly coming in to contact too (making behavior bilateral) or to transfer. The majority use the right as the dominant hand.

Most initial approach is now unilateral. There is a very great deal of transfer, mostly a two-stage transfer, with one hand grasping the object, the other hand coming in to hold the object, making grasp momentarily bilateral, and then the completion of transfer. Bilateral behavior occurs chiefly in handling large objects, in carrying objects to the mouth, and during transfer. There occurs here the beginning of that sort of bilateral behavior in which each hand holds a different object.

Variable factors: With many cases there is gradual shift of the approach hand as the examination goes on, the shift occurring about halfway through the examination and being maintained. At this age behavior is much influenced by size and shape and placement of objects. Large objects as cup and formboard are for the most part handled bilaterally. Spoon, pellet and bell often cause a change of some sort in behavior, often a shift from use of one hand to use of the other, which once set up is continued.

32 weeks

This is one of the two strong *bilateral* ages. There occur several kinds of bilateral behavior: simultaneous approach and grasp of large objects; grasp of an object in one hand and then other hand comes over to make grasp bilateral or for transfer; simultaneous manipulation of two objects, one in each hand.

TABLE 2 (*continued*)

Behavior seems to be strongly patterned and very similar from child to child. A typical pattern is: unilateral grasp, repeated transfer, bilateral to mouth, then waving in a preferred hand. Every child shows definite preference for one hand or the other. Transfer is still a two-stage behavior. Though clearcut, and rather uniform from child to child, behavior is extremely complex at this age. Non-dominant hand is used expertly on occasion.

Variable factors: In general at this age place in the examination seems to have very little influence on behavior. Nor does size and shape of stimulus object. A large object such as the cup may elicit bilateral behavior, and the bell may cause a shift from use of one hand to use of the other, but this shift is not maintained for the rest of the examination.

36 weeks

The behavior picture is quite similar to that seen at 32 weeks except that there is considerably *less bilateral behavior*. *The trend toward 40 weeks'* unilaterality is now starting. Bilateral behavior occurs for the most part when object is at the mouth, in the handling of large objects, or when the child is holding a separate object in each hand. Bilateral approach, even to large objects, is dropping out. Nearly all initial approach and contact, and most manipulation of single objects, is unilateral.

Behavior is extremely complex though not confused or fumbling. Both hands seem to be used about equally well and about equally frequently, though usually one is used a little more than the other in initial approach and in complex manipulation. Transfer has become so rapid that it is no longer a two-stage performance. Instead of the emphasis being on transfer and re-transfer, transfer is extremely rapid and the emphasis is on waving and banging in the one hand or the other.

Variable factors: Few show a definite shift of handedness as the examination progresses. Behavior is so complex that it is difficult to say that stimulus object particularly determines behavior. Cup does often elicit bilateral behavior; spoon, bell and possibly pellet sometimes cause a shift from one hand to the other.

40 weeks

This is *the most unilateral age during the first year*. In every child, however, both right and left hands are used (alone) very extensively, so that in some it is not possible to say which is used the more. Nearly all initial approach and contact and most manipulation are unilateral. Even quite complex manipulations, as combination of cup and spoon, are carried out unilaterally.

This is an extremely patterned age—the same pattern occurring repeatedly in any one child, and also from child to child. Most common pattern, perhaps, is grasp in one hand, brief bilateral holding, transfer,

TABLE 2 (*continued*)

and then waving or banging in the other hand. Transfer appears to be slower and of a more bilateral nature than at 36 weeks. In keeping with general unilaterality of the age is the fact that, even though both hands are alternately active, when either one is used the other remains extremely passive.

Variable factors: Characteristically there is a shift within the examination, though this is not uniform from child to child. In four the shift comes with the bell and in two of these it is maintained. In others, there is a gradual shift. The bell more than ever seems to be the object which brings about a shift of handedness.

44 weeks

The unilateral trend continues and even goes so far that for more than half the children a dominant hand is at least temporarily established. There is little bilateral behavior; the non-dominant hand remains for the most part passive on the table top. Unilateral behavior is now most commonly characterized as "right alone" or "left alone" rather than, as earlier, "right or left alone". There is frequent bilateral grasp of one object in each hand when two objects are presented, but even in complex situations much manipulation as well as approach and initial contact are unilateral.

Behavior is very clearcut: approach, contact and manipulation with a dominant hand, non-dominant hand remaining largely passive. Transfer is now a one-stage performance. In several children there is a change in handedness from that seen at 40 weeks—tending to be a change to the eventually dominant hand.

Variable factors: There is little shift of handedness within the examination. Nor is it characteristic for size and shape of object to have much apparent effect on behavior.

48 weeks

Unilaterality continues to predominate over bilaterality. The two hands are for the most part readily available and interchangeable, but there is little bilateral behavior. When it occurs it is usually in response to multiple stimulus objects. Bilateral approach and contact, or bilateral manipulation of a single object is rare.

There is a marked rise in use of the non-dominant hand (the left with this group of right-handed children) at this age. Each child has a preferred hand for initial approaches. Behavior is quite well patterned. Very frequently the response is grasp with one hand, immediate one-stage transfer, and then continued manipulation with the other hand.

Variable factors: At least half the children shift handedness with the bell and maintain this shift through the rest of the examination. The bell itself does seem to cause the shift but thereafter it appears to be the place of the situation in the examination—i. e. that it follows the bell—which influences behavior rather than the specific stimulus object.

TABLE 2 (*continued*)

52 weeks

Behavior is predominantly unilateral at this age and in over half the cases it is unilaterality of one predominant hand only, even to the extent that non-dominant hand remains passive on table or at side. In all cases, however, non-dominant hand is ready enough that it alone can make an initial approach and manipulate alone. Behavior appears quite mature at this age. Unilaterality of one dominant hand is quite well established, but passive hand is ready to make initial approach and manipulate some objects; and often the two hands are used in differential manipulation of a single object. Behavior is clearcut and there is definite predominance of the right hand in all children of our group except one.

Variable factors: There is no patterned shift within the examination at this age and no specific stimulus object brings about a shift of behavior. About half the children respond quite freely to some stimulus objects with the non-dominant hand but there is no uniformity about this from child to child.

56 weeks

For the most part behavior is *extremely unilateral* at this age, non-dominant hand remaining extremely passive. The total behavior picture is quite similar to that seen at 52 weeks. Only two children, who give the impression of being retarded in this function, exhibit an appreciable amount of bilateral behavior.

Behavior is somewhat less clearcut than at 52 weeks even though two of the cases have better established unilaterality of one hand at this age. However, there is in two cases much more use of both hands at once. There is little transfer. A child is more likely to manipulate an object in one hand, drop it, and then pick it up with the other hand to transfer it. There are only occasional traces now of the common 48-weeks pattern of grasp with one hand, immediate transfer, and manipulation with the other hand. Frequently an initial tendency to grasp with both hands, or with either one hand is inhibited and grasp is actually effected with the other hand.

Variable factors:There is no patterned shift within the examination, and size and shape of stimulus object do not seem to influence handedness response.

60 weeks

Extreme and clear-cut unilaterality of one dominant hand, to the point that non-dominant hand may remain completely passive on table even in multiple stimulus situations. The behavior picture is more straightforward here in this respect than in any following age till 5 years. There is extremely little bilateral behavior. Marked unilateral use of one dominant hand, quite clear at 52 weeks, less clear at 56, is strong here, stronger than it will perhaps be again until 5 years

Variable factors: A new kind of response is coming in. Nearly

TABLE 2 (*continued*)

all of the cases respond to the first situation in a manner different from that used during the remainder of the examination. Two children respond to the first situation bilaterally and after that use the right hand; one responds to the first situation with the right hand and thereafter uses the left; one makes no manual response to the first situation. The bell is the only test object which quite consistently elicits behavior different from that elicited by the other objects. Non-dominant hand tends to respond to this object, sometimes on a first, sometimes on a later presentation.

18 months

This is an age of *considerable confusion and variability of behavior.* In each of the cases unilateral use of one dominant hand (the right) does predominate and passive hand is usually very passive, but there is nevertheless a good deal of bilateral behavior. Bilateral behavior is more like that seen in the adult: a simultaneous attack, but one hand used in a definitely helping capacity. It is as though the two hands were used together at nearly the same level earlier, then separated off into unilaterality at around one year, and now were beginning to come back together but in something approximating an adult bilaterality.

The chief age characteristic seems to be confusion and variability of behavior even though there is little transfer and the hand which starts manipulation usually keeps it up. But there is no detectable pattern within any one child's behavior, or from child to child. Some children actually reverse handedness at this age and use predominantly the hand which has been the passive hand hitherto.

Variable factors: There is no patterned shift within the examination, behavior in general being too unpatterned for this to occur. Size, shape and particularly at this age placement of object seem to determine handedness, but there is no uniformity from child to child.

2 years

Every child but one shows *well determined unilateral behavior,* four of the preferred hand, two others of one hand or the other. There is little transfer. Bilateral behavior is not predominant in any though it frequently occurs. The passive hand is taking on more and more of a passive role in unilateral behavior. When behavior is "right or left" it is one hand in one part of the examination and one in another: not as earlier the passive hand being held ready to come in and take over on an equal level. . . . But when behavior is bilateral both hands may attack and manipulate simultaneously. This is paradoxical: the two hands are getting farther apart temporally in unilateral behavior but nearer together temporally in bilateral. Behavior is much more patterned and uniform from child to child than at 18 months.

Variable factors: There is no patterned shift within the examination and handedness appears little influenced by the kind of stimulus object except that complex or difficult situations such as pellet and bottle, and formboard, tend to elicit bilateral behavior.

TABLE 2 (*continued*)

2½ years

This is *a strong age for bilateral behavior.* In nearly every individual case bilaterality is strong and in one it actually predominates. This is characteristically an age of "opposite extremes" and we see this plainly in handedness. Bilaterality occurs in three ways: (1) Simultaneous bilateral approach and manipulation; (2) Passive hand held ready to come in as a helping hand. In almost no case does passive hand remain down by the side. (3) Use of one hand in one part of examination and of the other at a later time in the examination. . . There is marked variability and lack of uniformity within one child's behavior and also from child to child.

Variable factors: There is no patterned shift within the examination, just almost constant change. There is a marked tendency toward bilaterality with large objects, but otherwise extreme variabililty from child to child.

3 years

Unilaterality of one sort or another predominates in all cases, but there is a good deal of bilateral behavior in at least half the cases. Behavior of the passive hand varies considerably from ready to help at any minute, to active abeyance, to passive on table top, to hanging down at side. Probably the percentage of time when it is merely hanging down at side is increasing with age.

Three years appears to be the middle of a long cycle in which bilateral behavior is prominent, a cycle extending from 30 months through 42 months. Bilateral behavior is a little less strong at 3 years than at the six month nodes just preceding and just following. Bilateral behavior consists mostly in bringing in a second hand to help out, or simultaneous bilateral attack upon a large object. Behavior is not clearcut or well patterned at this age.

Variable factors: There is no patterned trend within the examination though much variety from situation to situation. Within a situation there is often a slight trend, however. Many situations start out with right hand and then end up with left or bilateral. This is just the opposite of what happens at 60 weeks. Size and shape of stimulus do not have any determinable effect on handedness except that behavior tends to become bilateral in the Goddard formboard situation.

4 years

Unilateral behavior predominates in all of the children but one. And in nearly every instance it is unilaterality of one predominant hand even sometimes to the extent of the passive hand remaining completely passive beside the body. However, bilaterality occurs in some cases strongly at the beginning of the examination, as at 60 weeks, this being soon replaced by unilaterality.

Variable factors: Marked bilaterality in nearly all at the beginning

TABLE 2 (*continued*)

of the examination (i. e. in the cube situations) gives way during the rest of the examination to unilateral behavior. Whether behavior is at first bilateral because of the cubes as stimulus objects or because of the place in the examination is not certain.

5 years

This age appears to mark a definite stage, all of the cases exhibiting *definite unilaterality* of the right hand at this age. In five of these the right definitely predominates and the left is almost completely passive. In two others right predominates but there is frequent use of left alone. There is very little bilaterality. Bilateral behavior seems to occur only when the situation is very difficult or involves several objects simultaneously, and even quite complex situations (as the Goddard formboard) are often responded to unilaterally at this age. There is more marked dominance of the dominant hand and more passivity of the non-dominant hand than at any preceding age. Non-dominant hand frequently merely hangs at the side.

Variable factors: There is no marked trend or patterned shift within the examination, either as regards order of examination or size and shape of stimulus objects *from this age on.*

6 years

The trend observed so strongly at 5 years continues even farther toward *almost complete unilaterality of the right hand in all cases.* For the most part, left hand just hangs passively down by the side. Quantitative analysis gives the average amount of right hand alone behavior as 75%, the most of any age thus far. At 5 years the figure was 60%.

Seldom does the child make a bilateral attack on a single object, even on a large one, though with multiple objects both hands are used in adult fashion, simultaneously and cooperatively. It appears that at this age unchallenged dominance of the right hand is usually established, if it has not been earlier.

7 years

Once more the trend toward clearcut dominance of one hand is slightly stayed,—though in more than half the cases right handedness is more completely established than ever, left remaining passive. Quantitative analysis gives an average of 80% of the examination time spent in right handed behavior, left inactive. In half the cases, though right hand predominates, behavior is less clearcut than at 6 years. Each child exhibits a good deal of left-handedness and one even retreats to considerable bilateral manipulation.

8 years

All but one case (who is consistently immature) have marked unilaterality of the right hand with left way down at side. Some do not even bring the left hand up to hold paper as they write, to steady the

TABLE 2 (*continued*)

tower as it threatens to fall, or in the complex free construction situation.

9 years

Behavior is definitely unilateral, of one dominant hand. Seven years was the last age at which marked use of passive hand, or of both hands, was observed. Tables and graphs indicate a perfectly clearcut picture of use of right (dominant) hand alone except for some bilateral in one immature child. For the most part the left hand remains passively down by the side, though in free construction it is brought up more than at 8 years.

10 years

Even more marked right handedness than at 9 years, left hand remaining passively at side much of the time even in free construction and writing situations. Very clearcut.

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lus objects. This does not necessarily mean that the physical qualities of a given test object provoke a change of pattern. Rather the test object simply reveals the strength of a given laterality trend at a given stage of maturity. If the trend is weak, it is readily affected by the test situation, including the shape and size of the object; if the trend is strong, it shows less fragility.

This variation in response to different objects is neatly brought out by the comparative chart (Figure 2) which compares the handedness responses (six cinema cases averaged) to the pellet with the handedness responses to the bell, during the first year of life. It will be observed that in responding to the pellet, behavior is at all ages predominantly unilateral, whereas at certain ages, namely 32 and 40 weeks, bilateral responses to the bell are conspicuous. Further, the relative amount of left and right handedness displayed in response to these two objects varies. Thus with the bell, through the first 44 weeks, left handedness alone and right handedness alone appear to an equal extent, whereas with the pellet, at 32 weeks left handedness is strong and at 40 and 44 weeks right handedness.

The individual differences in the emergence of handedness patterns can be best summed up in a table which distinguishes the six major forms as follows:

R, right.
L, left.
B, bilateral (sometimes in association with *R* or with *L*).
R or *L*, either right or left, right predominant.
L or *R*, either left or right, left predominant.
ʀ, right handedness well established.
ʟ, left handedness well established.

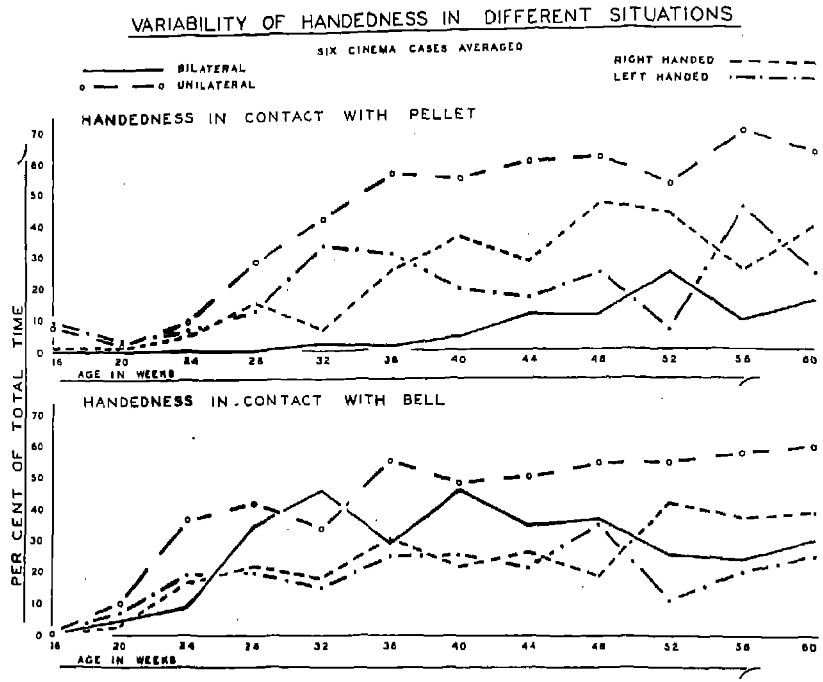

FIGURE 2

Twenty-two age levels are listed for the seven basic cinema cases in Table 3. All of these children proved to be eventual right handers. Similar, though less complete, records were available for two children who turned out to be definite left handers. One of these cases (*D. B.*) is added to show that comparable developmental shifts occur in left as well as in right handed children.

For one infant (*M. H.*), daily cinema records were available for most of the first year of life. This infant was photographed under strictly standardized conditions in the supine position. The subject lay in a cubicle where she could fixate on a stimulus object (three interlocked red, white, and blue plastic rings 4 cm. in diameter) which was suspended from a cord within easy reach. The stimulus object was slowly moved horizontally across the field of vision to the child's left and then back to her right. Each transit took 5 seconds or ten seconds in all. For the following ten seconds the object (the rings) remained stationary.

The spatial arrangements of the cubicle and of the experimental situation

TABLE 3

THE INDIVIDUAL DEVELOPMENT OF HANDEDNESS PATTERNS

Age	Individual Children B. C.	B. B.	C. J.	E. E.	F. J.	L. J.	M. B.	D. B.
16 wks.	R or L	L	O	L or R	L, R	L	L, B.	L
20 wks.	R	B	L, R	L or R	L or R	L	L	R, B, L
24 wks.	B, R	B, R	L, B	B, R	L	R	L	R
28 wks.	R or L	R or L	B, L	[illegible] or R	R	R or L	L	R
32 wks.	R, B	R	B	L, B	B, R	R	L	R, L, B
36 wks.	L or R	R or L	B, R, L	L	L or R	L or R	R or L	L or R
40 wks.	R or L	L or R	R or L	R or L	R or L	L or R	L or R	R or L
44 wks.	R	R	L	R	R, L, B	R or L	B, R	L
48 wks.	L or R	R	R or L	R or L	R, B	R or L	L or R	L
52 wks.	——	R	R or L	R	R or L	R	R, L, B	——
56 wks.	L	R	R or L	——	R	L, B, R	R, B, L	——
60 wks.	——	R	R	R or L	R	——	L or R	——
80 wks.	R	R	——	R or L	R, L, B	R, B	R, B	L
2 yrs.	R	R	R	L or R	R	R or L	R, L, B	——
3 yrs.	R	L	R, B	L or R	R, L, B	R or L	R, L, B	——
4 yrs.	R	R	R	R or L	R	——	R, L, B	——
5 yrs.	R	R	R	R or L	R or L	R	R	L
6 yrs.	R	R	R	R	R	R	R, B, L	——
7 yrs.	R	R, L, B	R or L	R	R	R	R or L	——
8 yrs.	R	R	R	R	R	R	R or L	——
9 yrs.	——	R	R	R	R	R	R, B	——
10 yrs.	R	R	R	R	R	R	R, B	L
16 yrs.	——	——	——	——	R	——	R	L

placed a premium upon symmetry of response. This very circumstance produced revealing data with respect to laterality trends. These trends are graphed in figure 3. Here it should be emphasized that the graph is based on a frame by frame analysis of the motion picture film and is plotted on the basis of actual time spent in postural and prehensory attitudes as follows:

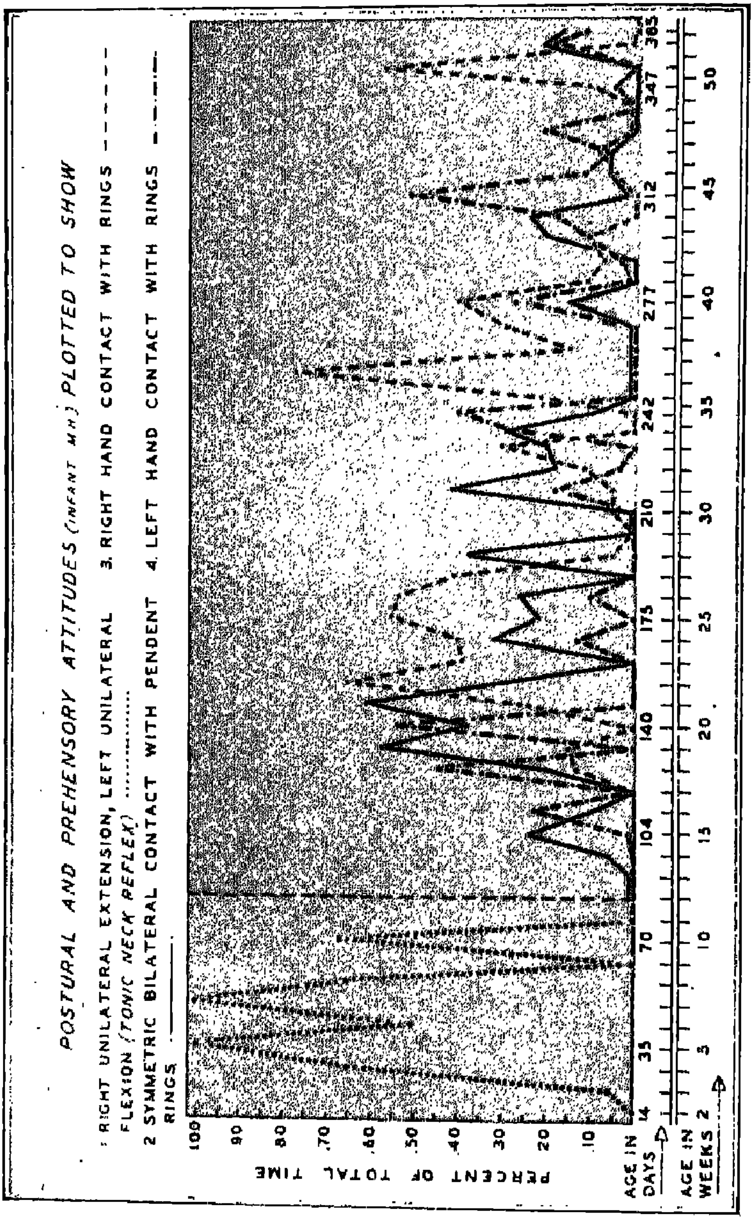
POSTURAL AND PREHENSORY ATTITUDES (INFANT MH) PLOTTED TO SHOW
1 RIGHT UNILATERAL EXTENSION, LEFT UNILATERAL FLEXION (TONIC NECK REFLEX) ....
2 SYMMETRIC BILATERAL CONTACT WITH PENDENT RINGS ————
3. RIGHT HAND CONTACT WITH RINGS - - - - - -
4. LEFT HAND CONTACT WITH RINGS -.-.-.-
PERCENT OF TOTAL TIME
100
90
80
.70
.60
.50
.40
30
20
10
AGE IN DAYS
14
35
70
104
140
175
210
242
277
312
347
365
AGE IN WEEKS
2
5
10
15
20
25
30
35
40
45
50

FIGURE 3

1. Right unilateral extension (tonic-neck-reflex).
2. Symmetric bilateral contact with still rings.
3. Right hand contact with still rings.
4. Left hand contact with still rings.

The graph shows a marked preponderance of asymmetric attitudes during the first 12 weeks of life; at 20 weeks, bilateral attitudes resulting in bi-manual contact with the rings are dominant. Thereafter, right unilateral, left unilateral, and bi-manual reactions recur in rhythmic alternations characteristic of the maturational process of reciprocal interweaving. Nevertheless, the recurring accent is on unilaterality, and right handedness consequently becomes steadily more pronounced. It was well entrenched in *M. H.* at the age of seven.

E. The Tonic Neck Reflex and Handedness

The earliest manifestations of human handedness are in some way bound up with the phenomenon of the tonic neck reflex. The *t. n. r.* is an attitudinal behavior pattern which figures fundamentally in the mechanics and the morphogenesis both of locomotor and prehensory movements. The head and neck very early exert a controlling influence upon the attitudes assumed by the limbs and the torso. In its classic form, the *t. n. r.* presents the following features: (*a*) the head is turned to the right (or the left); (*b*) the ipsilateral arm and leg are extended, the arm at right angles; (*c*) the opposite arm is flexed near the shoulder or occiput; the opposite leg also is flexed. A well defined tonic neck reflex may be observed even in the fetal infant as early as the 28th week after conception.

The possible role of the *t. n. r.* in the ontogenesis of handedness is suggested by the cinema records of our basic cases and strikingly so by the cinema records of Infant *M. H.* It will be recalled that the experimental set-up favored neutral or symmetric postural attitudes on the part of this infant. But even under the limitations of about 10 seconds of photography per day, a total of 65 separate *t. n. r.* patterns were identified. The accompanying graph (Figure 3) shows that approximately one-half of 834 seconds of cinematically recorded behavior from day 14 to day 88 were spent in the rightward *t. n. r.* attitude. Only one of the 65 *t. n. r.*'s was leftward, and that was maintained only momentarily.

All infants do not assume an equally emphatic right or left *t. n. r.*, but normative studies of full term and of premature infants, reported elsewhere, indicate an unmistakable predilection toward rightward orientation (10). The percentage frequencies for a large research group of full term infants are given in Table 4.

TABLE 4

Behavior items	*4 wks*	*6 wks*	*8 wks*	*12 wks*	*16 wks*	*20 wks*
Head predominantly rotated	100	97	93	84	20	0
Head predominantly rotated to the same side	72	64	79	69	33	—
Arms predominantly in t. n. r. attitude	100	97	93	64	30	0
Head predominantly in mid-position	0	4	7	15	67	—

A smaller group of normal fetal infants with postconception ages ranging from 28 to 40 weeks, also showed a high frequency of assymmetric *t. n. r.* posture (87%). In 77 per cent of these cases the orientation was toward the right (11).

The foregoing percentages show that the *t. n. r.* is not a stereotype "reflex" but is a growing complex which changes with maturity. Already at 12 weeks the *t. n. r.* is less conspicuous; at 16 weeks it is in transition; and at 20 weeks it is replaced by a symmetro-tonic reflex, in which the head is maintained in mid-position and the arms freely assume symmetric or bilateral attitudes. Such developmental changes are reflected in prehensory patterns and in handedness trends.

A more specific question now arises. Does a right *t. n. r.* predict right handedness, and a left *t. n r.* left handedness? The present study assembled 19 cases in which data were available as to the dominant *t. n. r.*, and as to the handedness evident at 1, 5, and 10 years (Table 5). In 14 out of the total of 19 cases, the direction of the *t. n. r.* was definitely predictive. In five cases it was ambiguous or contradictive. There were four cases in which left handedness was correctly foretold by a predominant left *t. n. r.* in early infancy.

Clinical observation of numerous cases confirms these trends and indications. As a rule, the *t. n. r.* is predictive of later handedness; but there are interesting and significant exceptions. The whole problem needs more careful study, because of its important bearings on the origin of individual differences in degrees and patterns of handedness.

F. Summary and Discussion

This study is based on periodic observations of a small group of normal infants and children, with ages ranging up to 10 years or more and with special emphasis on the first year of life.

Cinema records of behavior elicited by the Yale developmental examination procedures, supplied comparable and consecutive data at lunar month intervals for the first 60 weeks and at scattered intervals later. These records and supplementary stenographic protocols were subjected to detailed analysis.

TABLE 5

TNR IN SUPINE AS PREDICTING HANDEDNESS

Name	*Dominant TNR*	*Handedness* *1 year*	*5 years*	*10 years*
D. B.	*L*	*L*	*L*	*L*
E. J.	*L*	*L*	*L*	*L*
R. R.	*L*	*R* or *L*	——	*L*
R. A.	*L*	——	*L*	*L*
C. L.	*L*	*L*	*R* or *L*	*R*
M. D.	*L*	*R* or *L*	*R*	——
C. J.	*L*	*R* or *L*	*R*	*R*
E. E.	*L*	*R*	*R* or *L*	*R*
B. C.	*L*	*L*	*R*	*R*
B. B.	*R* or *L*	*R*	*R*	*R*
F. J.	*R* or *L*	*R* or *L*	*R* or *L*	*R*
M. B.	*R* or *L*	Varied	*R*	*R* or *B*
L. J.	*R*	*R*	*R*	*R*
H. M.	*R*	*R*	*R*	*R*
A. J.	*R*	*R*	*R*	*R*
W. B.	*R*	*R*	*R*	*R*
B. Ch.	*R*	*R* or *L*	*R* or *L*	*R*
B. Cl.	*R*	*R*	*R*	*R*
C. Je.	*R*	*R*	*R*	*R*

A developmental survey disclosed marked individual and maturity differences in the intensity, consistency, and the forms of patterns of handedness behavior. Four major forms of handedness were charateristically manifested during the first year by each subject in prehension and manipulation: (*a*) right handed behavior, (*b*) left handed, (*c*) bilateral, (*d*) bidextrous (right or left).

The course of behavior in a right handed subject (in seated position) is typically somewhat as follows: contact of object unilateral and with the left hand, 16-20 weeks; bilateral contact at 24 weeks; unilateral, usually right hand at 28 weeks; bilateral at 32; unilateral through the rest of the first year with now right, now left predominating; right hand dominance 52-56 weeks; marked interchangeability with considerable use of both hands or of left hand at 80 weeks; right hand at two years; considerable bilaterality from 2½ to 3½ years; right handedness in general predominating from 4 to 10 years.

The foregoing sequence represents a common pathway rather than a rigid time schedule. Nearly all children may follow a comparable sequence, but at different rates and with varying emphasis of successive stages of the journey. In some children the bilateral stages are long and pronounced. The modes of bilaterality also vary greatly from child to child and in a manner which suggests the individuality of sensori-motor constitution. The two hands may be used simultaneously with nearly equal skill. The subordinate hand may be slow and awkward; it may be very deft and alert; it may be expectant and poised ready if necessary to take the lead. Again, bilaterality at one age may give way to marked dextrality at the next age, and marked sinistrality or marked ambivalence at the next beyond.

Handedness is not a simple trait, but must be regarded as a focal symptom of the current status of a never changing action system,—which system, nevertheless, displays consistent symmetry and asymmetry trends over a long reach of growth. The morphogenesis of handedness, therefore, is complex. Like the tonic neck reflex in which it is rooted, it is subject to many variables.

Among these variables is eyedness. At certain stages of the *t. n. r.*, ocular fixation may be monocular and confined to the eye which is contralateral to the extended arm. But monocularity gives way to binocularity and eyes and hands can come into varied functional relationships, diversified for different children. The very shape of the head influences its rotability. Round heads are more mobile and more readily elect mid-positions which favor symmetric postures. Other infants with prominent occiputs may lie more rigidly and longer in *t. n. r.* attitudes. Such postural sets of eyes and hands have an inevitable effect on the ontogenetic patterning of handedness.

The bipolarity which bisects the Emersonian universe, bisects also the organization of laterality in a growing organism. Two pairs of opposing trends are in mutual rivalry: bilaterality versus unilaterality, and right versus left. This gives rise to many inflections and combinations. These trends are probably not in actual conflict or in true competition. They are in developmental flux. But the flux is partly channelized by virtue of *the principle of functional asymmetry.* Perfect ambidexterity, if it exists at all, would seem to be an abnormality, because effective attentional adjustments require an asymmetric focalization of motor set. Accordingly all normal children grow up to be right handed,—or left handed. Handedness is a product of growth.

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HOMO SAPIENS VERSUS HOMO MECHANICUS*[1]

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We have just overcome a crisis which threatened the continuance of mankind as a species of intelligent, versatile, creative, and ethical beings. Promoted by a group of criminals, it assumed violent forms. These criminals, called fascists, intended to establish a social order wherein the state would be the smallest free unit. The men and women living within this superorganism would play the rôle of mere cells whose existence would be justified only inasmuch as they would help to keep the state functioning. The condition would be analogous to the conditions found in some ant and termite colonies.

The immediate danger of the mechanization of human life has now been crushed by the representatives of human freedom and dignity. It is the object of the following pages to examine, by means of zoölogical criteria, whether the danger is conjured away or not by the defeat of official fascism. The following discussion is tentative. The writer hopes that corrections to this theory will be made by competent persons. These corrections, he hopes, may finally lead to a generally accceptable theory and perhaps policy.

At the basis of our consideration stand the following three postulates: (*a*) The most essential characteristic of Homo Sapiens in which he differs from other animals is not one of his anatomical properties. It is his *intellect,* his power of conscious discernment and of ethical judgment. (*b*) The evolutionary line which led to man is marked by a *gradual rise* of mental abilities. (*c*) It is *desirable that these mental abilities be maintained* in our descendants and that they be refined and amplified in future generations.

Assuming then, that these three postulates can be accepted, we shall now list *three reasons* for the extraordinary development of human culture and human intelligence: (*a*) Man has retained certain *primitive anatomical features.* This fact has enabled the various species of Homo and the populations of Homo sapiens especially to adapt themselves to many diversified modes of life and activity. One of the most outstanding of these primitive anatomi-

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cal features is the grasping hand with the opposable thumb. It is the physical basis of all human trades and arts. (*b*) Another feature, which is incidentally not primitive, although it occurs already in teleosts, is the *fovea centralis.* This structure compels us, in order to see an object wholly, to look at its parts one after the other. It may be the basis of analytical thinking. (*c*) The mentioned characteristics would amount to nothing without the enormous development of the *cerebral cortex.* Our brain is outstanding among animals. It is not primitive in comparison with the brain of other vertebrates. But though comparatively not primitive, it is at the same time not specialized. Considerable areas of the cerebral cortex have no special bodily function. They serve as fields of "association." According to impressions received and according to the will, these association areas can be used for any kind of thought or sentiment imaginable.[2] and most probably for many kinds of thought as yet unknown. We can say, therefore, that *the human brain* is not really specialized, rather "generalized," or even primitive in a higher sense, since the biologist conceives "primitivity" as a condition that can serve as a point of departure to many different, specialized roads.

The essence of human evolution may perhaps best be illustrated by means of the following passage from Hermann Klaatsch:

> The fact that man retained his hand, simple as it may seem, appears almost a miracle. Thousands of times destiny and need caused transmutation in related forms. How infinitely easily could destiny and need have forced all the primates into their merciless machinery. According to the principles of probability, the chances must have been infinitely little for such a delicate structure as the grasping hand to escape extinction through eons. It is the grasping hand which, through combination with an entirely different organ, the highly developed central nervous system, gained singular significance. This combination is the central point in the problem of the rise of man. (Translated from the German by the present writer.)

Human culture could develop, richly and diversified as it has, only by lack of specialization in our anatomical and neurological make-up. The great differences of cultural styles and of individual accomplishments result from the manifold possibilities in which connections can be made in the cerebral association areas, and from lack of specialized reaction patterns in this dominant part of our nervous system.

The practically unlimited possibilities in which our specialized hands can be used make it possible for our body to perform almost any task which the brain designs. Nevertheless, specialization of the individual has been required to create any detail of advanced human culture. Division of labor is a fundamental necessity for the higher civilizations. This specialization which is required for the production of any work of high quality is entirely different from the specialization which most animal species underwent. Among most animals, the entire species becomes specialized, and thus it becomes a better *competitor* with other species in the struggle for existence.

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[2] It may be noted that any kind of activity for which the cortex is unfit, is at the same time not imaginable.

Human specialization occurs in single individuals and is, in its true essence, not undertaken for the sake of competition, but for the sake of *collaboration* with persons specialized in a different direction. Animal specialization is slow; it occurs by way of incidental chromosomal mutations. Human specialization is achieved within a few years and is accomplished by influences consciously exerted upon the individual. Animal specialization is inherent in the germ plasm. Human specialization is not genetically inherited.

However, human specialization has something in common with caste differentiation found in ants and termites. This point will be discussed below. The behavior patterns of most animal species under given conditions of environment are almost inflexible. If there are changes, these take usually hundreds or thousands of generations and are due to changes in the chromosomal make-up. Human behavior patterns change from generation to generation. They may even change from one year to the next without this mutation's being based or having effect on the genes. Our mutability is due to the generalized organization of our cerebral cortex and it is possible through our primitive hands.

Among animals, not only they themselves are specialized in their behavior, but even the products of the activity of the members of a given species remain always the same. This means that the animals are so dependent on their internal organization that they can build their webs, their cocoons, nests, hives, burrows in given surroundings in one style only. The marching columns, flight and swimming patterns, bivouacs, among social animal, remain always characteristic for the species. Whether the reasons for their constancy lie in the nervous mechanisms or in gross-anatomical features, or (among social insects) in the ratio of the number of workers to that of soldiers, or in any other factor, its ultimate basis is hereditary, based on chromosome composition. So closely are these extra-somatic characteristics linked with hereditary factors that from their similarity, without studying the anatomy of the animal, the specialist can frequently determine the kinship of species.

In human culture this is altogether different. Little of the elements of the individual's accomplishments are original, to be sure. Human progress, of course, is largely based on the achievement of former generations, but as Alfred Emerson says: "Instead of the usual mechanism of heredity through genic patterns in the chromosomes, . . . the human species is the only organism which has developed an additional mechanism supplementing such biological heredity. . . . Man . . . transmits . . . symbols through exchange, talk, writing, drawing, photography, printing, telegraph, telephone and radio, not only to his immediate associates but to all parts of the world and to all succeeding generations"

The richness and beauty of human culture is due to changes and innovations, to inventions and discoveries. Our species has made the world richer through the creation of works of art; it has made the world more evident by finding and recording the abstract truth inherent in nature. Whoever accepts our third postulate will desire the constant growth of our culture, the continuous creation of new styles of art, the constant discovery of more truth and the ever progressively increasing ability of the average individual human being to understand and to appreciate these works of culture, and to partake in their creation.

We shall now examine whether nature provides for the desired progressive intellectual and cultural evolution beyond the level hitherto reached, or whether it counteracts further developments in this direction. Perhaps we have already reached or passed its climax. We shall also examine whether we can influence the further development of our species according to our desires.

An analogy with social insects might be helpful. Holmgren observed that caste differentiation among termites is based on degeneration of the individuals. Strong evidence has been presented recently by experimental means that this observation is really correct, inasmuch as workers and soldiers are formed from genetically identical larvae on which inhibitive substances seem to act, preventing their normal development into sexed and alate animals (Light, Castle, Gregg, Pickens). Holmgren makes the following remark which, though made *post hoc,* contains much truth: "From a consideration of communal life," he says, "we should expect . . . that it would gradually lead to a degeneration of its participants, since natural selection should bring about not the higher differentiation of the individual, but only that of the colonies. The depressing effects of social life might be attributed to the ever increasing division of labor and caste differentiation. On the whole, therefore, we can postulate a regressive development in the termites."

There are indications that what Holmgren says about the termites is already beginning to happen to our species.

The development of the sciences and of technology, the growth of large cities and the migration from rural districts to these cities, have created an ever increasing division of labor. In industry, the number of workers who know only a few special manipulations in the complicated process of production is steadily rising. These workers do not need to understand the production process as a whole.

The growing one-sidedness is not limited to the stratum of unskilled labor. The modern high schools segregate the pupils into specialized programs of study, and the colleges are so organized that a person "majors" in one subject and takes a few "minors." Of non-related subjects he learns practically nothing. As a typical example we may mention that there exist many biology "majors" who have taken courses in taxonomy, ecology, and physiology, but who know very little of embryology or paleontology. Of mathematics, they have learned only the beginning, and they know nothing about non-Euclidean geometry and geometry of more dimensional spaces. Many of them have not heard of the evolution of the earth on which and from which the objects of their study live; they have no idea of the structure of the universe. These are bachelors of science, but it appears that not only a bachelor of science, but every human being owes it to his dignity to have a conception of these matters.

Frans Verdoorn recently said:

> There are no longer professional biologists. There are only specialists in the various branches of pure and applied plant and animal sciences. With every generation, an increase in specialization seems to become necessary. Great as the literature and body of facts of any branch of biology may be, I do not agree that all this specialization is necessary. Can we not educate our pupils with the feeling that they are in the first place biologists, and specialists in some branch of plant or animal science in the second place? Also all biology continues to have close ties with the humanities. We cannot raise a satisfactory crop of young biologists if they and we are not governed by this knowledge.

There are also many of matured scientists whose daily tool is the microscope and yet who know nothing of its optical principles. They know much less of classical languages, literature, and history. These latter subjects are despised altogether, though we should remember that among the 55 members of the constitutional convention who founded our republic, there were few, if any, who did not have knowledge of Greek and Roman history and literature, though they were not professional historians. Without their knowledge of Athenian and Roman democracy, our great constitution would never have come into being. To their universal culture we owe our liberty.

Specialization for a vocation and for a limited field within a profession has become a necessity. The growing division of labor in modern economy and the accumulation of vaster bodies of knowledge in every field of science and letters has forced this upon us. But this specialization, necessary as it is, is a source of great danger. At its best, specialization is the coronation of a universal training and education, begun when the individual has attained full maturity and knows the reason of his choice. Unfortunately, however, it is usually undertaken under elimination and suppression of practically all "unrelated" mental faculties, skills, and knowledge.

Primitive men, as well as our primate ancestors and related forms, were and are constantly compelled to exert themselves and their brains in the struggle for existence. Modern men, living under hot-house conditions can exist without versatile mental exertion, or they are enslaved in monotonous jobs. In both cases, universal mental exercise is not a necessity for survival. If continuous thinking is required in a job, it remains usually the same kind of thinking. Even most scientists, though they have to solve continuously new problems, always investigate problems of the same kind. Methods and apparatus for research have usually been provided by preceding generations of scientists. Only seldom is an investigator compelled to invent an entirely new method. In biology, we have had only two real innovations of method during this century: the operative experimentation with embryos and tissue culture. Micro-dissection is only a change in the order of magnitude from old physiological methods.

If scientists are one-sided, how much more so are common people! Our one-sidedness has been furthered by the rise of materialism and utilitarianism, promoted by such men as Ludwig Büchner and Ralph W. Emerson. Büchner's famous book *Force and Matter* (Kraft und Stoff, 1855) became popular in the entire world during the second half of the past century and has been reprinted frequently even during this century. Through its large circulation among half-cultured people it created a general contempt of spiritual values and of "useless" knowledge, in spite of the fact that Büchner himself had no such intentions. Emerson's writings had not to be misinterpreted to arouse contempt for everything not materially profitable. The theory of evolution, popularized by Haeckel and misinterpreted by most readers, gave to the people two dangerous ideas because the fact of evolution became simplified in the minds of laymen. One of these misconceptions was the belief that evolution is an automatic upward movement. It was believed by many that nature itself promoted our progress and we could expect a continuous refinement of mankind without effort. This misconception was picked up by the representatives of a pedagogic movement which calls itself, misleadingly, "progressive education" and which has permeated the school systems of several Western countries. The idea of effortless progress led, in the minds of school teachers and theoretical pedagogues, to advocating relaxation of the seriousness of study. The child would develop, so it was argued, according to the progressive trend nature had implanted into it. Studying, therefore, would not need to be enforced. On the other side, and very inconsistently with the first misconception, the theory of the "survival of the fittest" coöperated splendidly with Emersonian rugged individualism to develop an elbow philosophy of life and a more and more utilitarian orientation of education. The new utilitarian doctrine of education, first proclaimed by Georg Kerschensteiner (1908) and later more and more exaggerated, may perhaps be caricatured thus: "bring up the youngster so that he may be able to make all money possible with a minimum of knowledge."

Thus we find ourselves today in a state of intellectual degeneration. Specialization is not the evil, but an evil is the inhibition of each individual's inherent mental faculties. Only a small fraction of the available neurons and pathways in our brains are used. The brain is not given an opportunity to exercise itself nor is it filled with contents. Instead of occupying himself in his leisure time with interesting and important questions on history, nature, art, or politics, the average individual is content with reading comic strips.

Under city conditions, physical exertion is not a necessity for survival for many. In order to overcome the resulting danger of physical degeneration, gymnastics and sports have been substituted for natural exercise. The animal's instinct to use its muscles is old and therefore strong enough in us to cause in young people a desire to do so. The cerebral cortex on the other side is a relatively recent acquirement. It does not move without stimulation. Therefore, brain gymnastics are undertaken by few individuals. Chess players are rare. The last vestige of intellectual gymnastics by most of our contemporaries seems to be the crossword puzzle.

Since the schools which should be the last bulwarks of intellectualism do not perform their task of training the mind universally any longer, the degenerating influences are given full power to do their destructive work. Ever increasing technical and commercial division of labor is to be expected. Specialization will begin earlier and earlier. The last modest remnants of cultural subjects seem to be doomed. Thus it may come about that human society will assume the character of a termite colony with rigid, irreversible caste differentiation. The mechanism of human caste differentiation would not differ principally from that in termites. In our case, as in theirs, caste differentiation will not depend on genetical differences between individuals; but the postnatal development of the individual will be directed by external influences. At present, caste differentiation in man is still in its initial stage. It is promoted by educational means. James B. Conant is the most prominent advocate of this educational caste differentiation. Characteristically enough, the vocational and pre-vocational specialization is not accomplished by an intensified training in the vocation which has been chosen for a child, but by the lack of training in all matters which have no immediate connection with the chosen vocation. Inhibition is the chief means of vocational specialization. This does not appear so at first sight, because the scarce training in the chosen vocation is so conspicuous in contrast to the other, neglected subjects, that it seems intensified. A comparison with the secondary schools of Europe at the close of the 19th and the beginning of this century will demonstrate, however, that our modern specialization system is not one of intensification.

Every graduate from a French lycee or a German Gymnasium or an Italian liceo had acquired at the close of 12 years of schooling (i.e., at the average age of 18 years) as much knowledge of subject matter as about three modern college graduates together will have acquired after 16 years of schooling (at the average age of 22 years). The latter "major" in one subject; let us take, for example, mathematics. In this field, at the age of 22 years they will have arrived at such branches as differential and integral calculus, analytical geometry, and differential equations. The fundamentals of most of these fields were, however, known to 18-year-old graduates from old-fashioned European secondary schools. We cannot say, therefore, that the study of mathematics is intensified for modern mathematics majors. On the contrary: they are delayed a few years in the attainment of that knowledge in their chosen field which was formerly the common good of all high school graduates, for whom mathematics was only one of four major subjects (namely: mathematics, Latin, Greek, and the native language).

If a modern student is graduated in classical languages at 22 years of age, he will not have reached the level which a pupil of an Italian liceo had to reach at about 17 years of age, namely: the ability to make public, extemporaneous discourses in Latin and to participate in public debates in Latin. And one must consider that those Italian high school pupils knew calculus as well as they could debate about scientific, literary, or historic questions in Latin. Again we see: modern specialized training in classical languages is not intensified, but rather delayed, compared with the European standard of about 40 years ago. A little earlier, around the year 1890, in the United States there was a similar climax of secondary education.

Educational inhibition, however, is not the only means by which caste differentiation could be accomplished. Surgical interferences with endocrine influence can be and have been used for vocational specialization: Castration has been a method to produce eunuchs and male soprano singers. In the first case, inhibition of an important bodily function was the purpose of the operation. In the second case, this inhibition was borne along with the proper purpose of maintaining an infantile voice. In both cases, disregard for the integrity of the human being, their unscrupulous exploitation to serve the selfish purposes of others allowed these mutilations.

Increasing industrialization, enlargement of economic enterprises, and their merger into impersonal corporations and cartels reduces more and more the personal contact between employer and workers. How should there be hope, then, in the future for more regard and respect for their integrity and dignity as human beings than in the past? It may come about that other mutilations will be invented which seem to make individuals better fitted for special jobs. Also, administration of hormones may be used for the same purpose. These interferences do not affect the germ plasm; and as long as vocational specialization is restricted to measures which act on the somatic cells only, a slight hope of recovery remains.

But the German fascists had already begun, on a modest scale, systematic breeding of genetic traits which they desired. The method of utilizing Mendelian breeding methods has, in non-German nations hitherto been confined to crop plants and livestock. Its application to the human species is not impossible, if enforced by the state; and this would be the greatest danger. In this case, we could have a real splitting of mankind into mentally and physically different breeds. That this is contrary to all principles of democracy and to the idea of the original equality of men is immediately evident. The most competent worker in any field is a man who is a well rounded personality, who can therefore understand the significance of his own work for society as a whole. In spite of this, the underlying principle of modern education as well as that of other inhibitive measures is, unfortunately *not*: "How can a person become more able in his field?", but rather: "How can he be made unable for everything but his field?" It can therefore be expected that in foreseeable time our species will no longer deserve the epitheton ornans "sapiens," but it might be better to change the name to "Homo mechanicus."

With the rigid vocational differentiation fewer and fewer individuals will understand the significance of their own vocation, because its relation to other phases of life is unknown to them. It can also be expected that gradually certain schemes of organization of enterprises and of the state will be worked out so that even their top-administration becomes a routine matter no longer requiring real understanding. Then, society will have become automatic. The individual will no longer have a free will, but will only be able to act according to the machinery set up for him.

If we adhere to the desire that the mental abilities of man be maintained in our descendants and that they be refined and amplified in future generations, we must view the present development with alarm. We must try to stop it by educational measures as soon as possible, for there are few individuals left who still have knowledge of culture. The overwhelming majority thinks that culture is useless or even harmful. A few more generations hence, it might be forgotten altogether and there might be no person left whose training would be sufficient to make him understand the treasures piled up in libraries and museums. If we allow human evolution to proceed in its present direction only for a few generations, the only hope for a revival of the human intellect might be total destruction in a catastrophical way, of our entire civilization, so that the naked survivors would have to depend on their wit for the maintenance of their lives. Thus, they might give their brains new training, and in some thousand years to be able to create a new, high civilization.

Relying on a catastrophe seems rather uncertain and wasteful, if we consider that it might take thousands of years before there will be such a catastrophe and that in it, and even before it, all the former accomplishments of mankind will disappear. For many generations we would, then, see our descendants as savages before new civilizations can slowly arise.

Thus it seems more convenient to propagate and to expand the existing culture and to equip the coming generations for this task. We should endeavor for a continuous rise of man as an illuminated species. Man is the coronation of the creation because of his ability to appreciate, to understand, and to enrich the world.

We ought to resist with all our might the degenerating trend of communal evolution. The former rise of mankind was a series of intellectual struggles and endeavors. The idea of primitive man to protect his hairless body with the fur of animals, the idea to use a stone as a weapon as a substitute for strong canine teeth, the inspiration to create mural paintings in caves were intellectual accomplishments as great as the discoveries of Leonardo, Newton, Galileo, Copernicus, Darwin, and Einstein, as the works of Phidias, Michelangelo, Homer, Shakespeare, Corelli, Bach, and Rembrandt, and as the thoughts of Moses, Plato, Thomas of Aquin, Spinoza, and Descartes.

Shall we not endeavor to maintain and even continuously to raise the ability of mankind for such grandiose performances?

The way to do it is through education. We need at first a renaissance of humanistic education in the broadest sense of the word. After that renaissance only is an upward development possible.

During the past 40 years, mankind has sunk terribly. We have, at first, to put on the brake to the downward racing vehicle of culture. After we have brought it to a standstill we have to start it slowly and against much inertia to move upward again. To regain the height of 1900 will require great effort.

From the above considerations a clear program results:

Every individual must obtain a broad and general education *before* vocational or professional specialization is begun. The specialization must become the coronation of education. This idea found concrete expression in a recent scientific convention in Cleveland, Ohio: Margaret Mead regretted that at present anthropologists are too specialized. They are trained either in physical anthropology, as linguistic anthropologists, or as sociologists. None of them alone, she said, was able to investigate or to understand all the problems offered by any special tribe. She postulated a more universal training for anthropologists. Fay-Cooper Cole proposed to require of anthropology students intense study of physical anthropology, linguistics, and sociology, before giving a master's degree. Only after this would he allow specialization in one of these fields. It should have been added that before the prospective anthropologist is admitted to college, he should have obtained a broad, general education.

But what is said about the training of anthropologists, can be stated for the training of everyone. The prospective factory worker, before admitted to the necessary mechanical training, the prospective carpenter, butcher, commercial employee, etc., before admitted to an apprenticeship should have completed a program of study which makes him an enlightened human being. All phases of human culture, and all branches of natural science should be known to him in their fundamentals, so that he may have an idea of their present and past significance, of their methods and their history.

The necessary program of studies for every child, with the exception of the feebleminded, includes the primitive and fundamental phases of culture as well: Farming, carpentry, forging, tanning, spinning and weaving should be compulsory subjects, even for children of aristocratic families. Without knowing these things, it is impossible to understand the physical basis of our life. Having tried himself, even unsuccessfully, in carpentry gives to a scholar, to a businessman, respect for the accomplishments of a good carpenter.

For everyone there should be training in mathematics, physics, chemistry, geology, and biology; in astronomy, geography, and world history; in classical languages, art, music, literature, and dramatics; and the maximum of knowledge which can be imparted with the greatest effort of teachers and pupils should be the minimum to be required. This means in *all* these subjects for *everybody*, for the prospective farmer as well as for the prospective philosopher.

Many will protest against such a program on the ground that individual differences exist and that for many some of these subjects are unassimilable. This is true, yet not a sufficient reason not to teach every subject to everyone. It is nowadays often forgotten that interest in some subject is awakened in certain individuals only after many years of study. Usually, the fundamentals of difficult subjects are uninteresting, but the higher phases of the same subject become fascinating. In the case of the present writer it happened that he hated Latin and mathematics, until he reached, under compulsion, Tacitus and analytical geometry. From that stage on he liked to study them, even so much so that he became a teacher of mathematics. Modern pedagogues would not have allowed him to reach that phase in which the subject becomes interesting. But if interest is never obtained in some subject, the compulsory study of it is useful nevertheless. For it is through failures that the person learns to recognize his own limitations, that he becomes all the more conscious of his ability in the subject for which he is talented, and that he learns to respect the work of people in vocations different from his.

Of course, school life can then no longer be easy and playful. It will be as difficult as it was for our grandfathers to go through school. But no species has yet made progress without hard struggle. Those species which discarded effort have invariably been exterminated or have miserably degenerated. As the most characteristic example I will mention the Rhizocephala, higher Arthropoda who have been transformed to a formless sac and mycelium of threads growing within the body of their host. However, if we adhere to the philosophy of the "Paese dei Balocchi" (Pleasure Island) from Collodi's *Pinocchio*, our degeneration will go in another direction: Our descendants will become a group of continuously mechanically active serfs.

No other choice but hard study for our children remains, if we wish to avoid universal, mechanical slavery and if we desire progress of mankind in the direction of freedom.

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THE DEVELOPMENTAL HISTORY OF A GROUP OF TRIPLETS*

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Studies have been made of various phases of the physical development of single-born children and of twins, but few have been made of the physical development of triplets. Fisher (7) measured several anthropometric traits of 146 sets of British triplets when they were six-and-a-half years old, comparing them with single-born children of different social strata. He concluded that the triplets were equal in stature to the singletons, but inferior in other traits. He stated also that although triplets are often prematurely born, they overcome this handicap during the long periods of infancy and childhood, and suffer no permanent ill effects.

A. SOCIOLOGICAL FACTORS RELATED TO DEVELOPMENTAL HISTORY

The present study is based on questionnaire data obtained for 229 sets of triplets and on a more detailed examination of the 29 sets with whom personal contacts were possible. The sex is known for 189 of the 229 sets of triplets on whom some data were collected. In 70 sets all three triplets were females; in 46 sets all three were males; in 35 sets, two triplets were females and one was male; in 38 sets, two triplets were males and one was female. The preponderance of females is in accordance with the sex ratio for multiple births. In age, 223 sets of triplets ranged from early infancy to 79 years. Twenty-nine per cent of the group was under five years of age and about 70 per cent was below 20 years of age as compared with 9.3 per cent of the general population under five years of age and 38.8 per cent under 20 years of age according to the United States Census for 1930 (20). Obviously, then, the triplet group contains a larger proportion of preschool children and a smaller proportion of adults than is found in the general population. At least six and perhaps more sets of triplets are over 50 years old. Although the exact number and ages of the older triplets are not available, a sufficiently large number are over five years and again over 50 years old to refute the idea that practically no triplets live an average life span.

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The questionnaire included a question on the occupation of the father. The 62 replies to this question were checked against the Minnesota socio-economic classification (9). Seventeen or 27 per cent of the fathers were in the three highest groups and 45 or 72 per cent in the four lowest groups. The mode was 54 per cent in group four, the classification for farmers. These percentages are important in the interpretation of the findings of the study because some investigations have found that city-born children and children from the higher socio-economic levels are superior to country-born children and children from the lower socio-economic levels in such anthropometric traits as height and weight and in nutritional status.

TABLE 1

SOCIO-ECONOMIC CLASSIFICATION OF FATHERS OF TRIPLETS

Group	Number	Per cent	Per cent of employed males in general population
1	7	11	2
2	3	5	5
3	7	11	14
4	34	55	18
5	5	8	27
6	3	5	13
7	2	3	19
Below 3 but not classified	1	2	1

Parents of the triplets traced their ancestry to 30 different racial or nationality groups. The largest numbers are of German, English, and Scandinavian extraction. The majority of the parents of the triplets, like the majority of parents in the general population, were born in the United States.

The relation between parents' age and frequency of tripleting was sought. The age of 58 fathers at the birth of the triplets ranged from 23 to 54 years; the mean age was 37.33 years with a sigma of 6.95 years. The age range of 59 mothers was from 21 to 44 years; the mean age was 33.7 years with a sigma of 5.35 years. These figures were compared with the ages of parents of all triplets in the United States as given in the United States Census Report of the Birth Registration Area. Although there are certain discrepancies between the percentages in some of the age groups, the trend both for the United States as a whole and for the present group is for parents of triplets to be older than parents of single-born children and twins. The proportion of triplets among births varies directly with the age of the mother.

The fathers of triplets belong to the older age groups because most men are about the same age as their wives or slightly older.

TABLE 2
PERCENTAGE OF MOTHERS AT DIFFERENT AGE PERIODS TAKEN FROM U. S. A. CENSUS REPORT FOR 1929

Age period	Single births	Twin births	Triplet births U. S.A.	Triplet births Present group
35-45 years and over	14.7	23.33	28.33	49.14
20-34 years	71.6	69.21	63.32	50.83

In the 64 families who answered the question concerning the number of children in the family besides the triplets, the range is from no other to 12 other children. Thirty-seven per cent of the mothers reporting no other or one or two other children were still in the child-bearing period, so their families cannot be considered as complete. Thirty per cent of the mothers had five or more children in addition to the triplets.

According to the United States Census report for 1929 the average number of children per family is 3.2. As shown by the committee on the Infant and Preschool Child of the White House Conference on Child Health and Protection (22) which gives the average number of children in the American family according to the socio-economic classifications, the lower the socio-economic status of the family, the greater the number of children. Data as to whether multiple birth is hereditary were sought in several questions concerning the history of multiple births in the triplets' families. Two cases of one mother bearing more than one set of triplets were reported to the writer, but none of the mothers included in the present study reported this for themselves. Sixteen per cent of the 78 families answering the questions on multiple births stated that their triplets had twin siblings; of these, 12 per cent reported one set of twins and 4 per cent, two sets of twins. Only three families knew of triplets among their ancestors (one set on the maternal side, two on the paternal). Forty-eight (64 per cent) of these families reported, however, that there were one or more sets of twins in the more remote family history. Of these, 32 per cent were on the maternal side, 29 per cent on the paternal; 2 per cent did not specify. These answers, incomplete as they may be, indicate that multiple births are of a hereditary nature.

B. BIRTH HISTORY OF TRIPLETS

Mothers and physicians were asked to describe the health of the mothers during pregnancy as good, fair, or poor. Since many of the women had experienced more than one pregnancy, they were asked to compare the multiple pregnancy with the single. In most instances they said that their health was about the same in the two types of pregnancies. The greatest amount of poor health occurred near the end of the pregnancy. Sixty-one mothers and physicians answered the question; of these, 44 per cent rated the health as good, 40 per cent as fair, and 14 per cent as poor. In view of the many complications found in multiple pregnancies, the percentage of poor health reported is low.

Replies were received from mothers and physicians on the length of the pregnancy. As with other questions when answers were given by the two sources for one family, the correspondence between the two was close. In 36 per cent of the 74 cases about which information was received, the birth was reported as being from 4 to 8 weeks premature; in 48 per cent, at term; in 2 per cent, postmature. These figures indicate that a fairly large percentage of the triplet births are premature, but that the percentage of prematurity is not so great as that reported in the literature for twin groups. The data must be interpreted in the light of the rather inexact usage of the expressions "born at term" and "born prematurely" owing to the difficulties of determining the exact date of conception. The range of prematurity for various general populations is from 10 to 20 per cent. Hess, Mohr, and Bartelme (12), Capper (4), and other investigators working with prematurely born children state that multiple pregnancy is the largest single cause of prematurity. It is to be expected, then, that any triplet group would contain a large percentage of prematurates.

In nine cases triplets were delivered by Caesarian operations and in a few instances, instruments were used for versions, but the majority of the deliveries were spontaneous. The type of presentation was stated for 50 triplets. Of these cases some form of head presentation was reported for 52 per cent. The answers concerning the type of fetal membranes were so ambiguous that they did not warrant tabulation. Seven triplets were placed in incubators after delivery, resuscitation was used with one, and two had cyanose conditions.

Another item in the birth history of triplets is the length of time between the delivery of the triplets. The range for the time between the delivery of the first and second triplets is from no time—that is the babies followed in such rapid succession that no time interval was noted—to 33 hours and five minutes. The interval for 61 per cent was less than 50 minutes. The range for the interval between the second and third triplets is from no time to five hours. The interval for 81 per cent was less than 50 minutes. The tendency is evident for the interval to be less between the second and third triplets than between the first and second. Very long intervals are the exception.

The data in this study are on triplet sets in which all three triplets survived the first year of life. It is interesting to note the number of stillbirths among single-born and multiple-born within the United States birth registration area. The United States Census report for 1929 shows that 3 per cent of total births were stillbirths. Considering plural births in which at least one child was born alive, 5 per cent of the twins, 8 per cent of the triplets, and 17 per cent of the quadruplets were stillborn.

Birthweights were given for 210 triplets, 90 males and 120 females. The mean weight for the two sexes together is 4.84 pounds; for the males, 5.20 pounds, sigma 0.19; for the females, 4.82 pounds, sigma 0.21. Day (5) gave the average birth weight for 116 twins as 5.72 pounds. Seven per cent of the triplet boys attained the average birth weight of boys in the general population as given by Woodbury (25); and 9 per cent of the girl triplets reached the median for girls in the general population. The mean of the triplets is about two pounds below the average for unselected singletons; about three pounds below the average of the Stanford gifted children (19); and practically the same as for twins. The average low birth weight of the triplets is in accordance with the premature births of more than a third of the group.

C. DEVELOPMENTAL HISTORY OF TRIPLETS

Several questions were asked about the nursing and weaning of triplets to ascertain whether their postnatal nutritional start is similar to that of single children. Information was given on 137 triplets concerning the length of time nursed fully. The median length of time that 71 triplets were breast fed was 1.8 months.

The White House Conference inquiry reports on the breast feeding of 1,856 children representing the seven socio-economic classifications. Nineteen and nine-tenths per cent of these children never had been breast fed. The median length of time for which the remaining 80.1 per cent had been breast fed was 6.6 months. These figures indicate that triplets are wholly breast fed for a shorter length of time than the average child. The limited supply of the mother's milk is the obvious cause for this.

Answers were received concerning the length of time that 117 triplets were nursed partly. Forty-five per cent had received no part time nursing while nearly 10 per cent had been nursed partly for as long as 12 months. The medium number of months for which 65 triplets had been partly breast fed was 7.59. This may be compared with Woodbury's statement that 35.6 per cent of the general population is nursed at least partly for 12 months.

The age of weaning from the bottle was given for 131 triplets. The range was from 8 to 42 months. The median age of weaning was 15.7 months.

The development of walking was traced by means of data on several items in the motor sequence. The first was sitting alone without support for which the median age was 8.0 months and the mean 8.18 months. Shirley (17) gives the seventh month as the median time for the appearance of this trait; Buehler (3) gives the eighth month as the average. The next item in this series was age of standing alone without support. Table 3 shows that there is a difference of more than two months between the median and the mean for the triplets. Since data on single children report only the median no comparison can be made with the mean; but on the basis of the median the triplets are equal to the singletons of Buehler's group (median 12 months) and superior to Shirley's (median 14 months).

TABLE 3
AGES AT WHICH DEVELOPMENTAL TRAITS APPEARED IN TRIPLET GROUP
(Ages in months)

Trait	No.	Range	Median	Mean	*SD*
Sit alone	105	4-24	8.00	8.18	3.04
Stand alone	87	7-27	12.30	14.10	2.40
Walk alone	132	9-36	16.00	16.90	5.25
Erupt first tooth	85	4-20	9.52	9.16	3.18
Shed first tooth	35	36-96	71.58	72.84	13.20
Say first word	82	8-36	16.00	16.90	5.35
Talk in sentences	81	11-84	20.08	20.65	8.25
Bowel control established	96	9-48	24.33	25.68	11.28
Bladder control established	94	9-48	22.72	25.44	11.28

Related to developmental traits is the question of handedness. In order to determine whether the triplets were totally or partially right handed in some of the more common acts that carry with them a consciousness of handedness, questions were asked about the preferred hand in writing, eating, ball throwing, and lifting. Replies were received for 130 triplets. According to the parents, 35 per cent of the triplets were taught to use the hand which they now prefer; the other 65 per cent are using the hand, whether right or left which they began spontaneously to use. Although there were exceptions, the tendency was for a triplet who was left-handed in one of the acts listed to be left-handed in all four. Counting every child left-handed who showed such a tendency in one or more types of act, the writer found that 24 triplets or 18 per cent showed a preference for that hand. In the almost complete absence of data on handedness in triplets, these findings may be compared with those of Wilson and Jones (24), who have published the most extensive study of handedness in twins. They found that in a throwing test, 6.5 per cent of 521 single-born children were left-handed; 4.1 per cent were left-handed in writing. As compared with these figures, they found 11 per cent left-handedness in a group of 386 twins. All these percentages are rather low. Percentages found by different investigators range from 4 to 30, but the average may be taken as about 25 per cent. Probably the findings on the present study are as reliable as could be obtained by questionnaire. In the tested group the writer found a high degree of correspondence between her observation and the questionnaire reply. No reliable difference was found between the two sexes or between the so-called identical and non-identical triplets.

The development of these various traits in triplets is of chief interest when compared with that of single-born children. Unfortunately, for some of the traits observed, there exist no adequate norms. The averages given by Buehler have not been proved applicable to children in the United States. Gesell's figures can be considered norms only in the widest sense of the word, because they allow for such a great range of performance. Interpretation of Mead's norms is uncertain because he does not make clear the level of performance required for "talking." The median ages given by Shirley for the appearance of traits were derived from small samples, and although her developmental sequence is considered valid, the median ages might differ for larger groups of children.

Likewise the data in the present study are open to a certain amount of criticism. The fact that they were obtained by questionnaire implies shortcomings and limitations. Although some of the information was taken from baby books where the child's age at the appearance of a developmental trait was recorded either at the time or shortly thereafter, for most of it the mother depended on her memory, which in some cases extended over a period of 20 years. In the personal interviews the writer did not urge the mothers to tax their memories and in doubtful cases simply asked them to compare the triplets' development with that of their singleton siblings. Despite these and other precautions, the writer is certain that some inaccuracies have been recorded. This is true especially of the data on the development of talking, for the average ages given for saying the first word and for talking in sentences are above all norms given for single-born children. The findings for these two developmental traits can therefore scarcely be credited. The averages for the other traits which are more in accordance with the available norms are more likely to be approximately correct.

TABLE 4
COMPARISON OF TRIPLETS AND SINGLETONS IN DEVELOPMENTAL TRAITS

Developmental trait	Singletons' standing (Age in months)			Triplets' standing	
	Author	*N*	Median	*N*	Median
Length of time nursed partly	White House Conf.	1487	6.6	65	7.60
Age of sitting alone	Buehler	?	8.0		
	Shirley	25 ?	7.7	105	8.00
Age of standing alone	Shirley	25 ?	15.5	87	12.30
Age of walking alone	Mead	50	13.5		
	Smith	159	13.5		
	Shirley	25 ?	15.0	132	16.00
Age of erupting first tooth	Abt	?	6-8 (av)	85	9.52
Age of shedding first tooth	Abt	?	7th yr. (av)	35	71.58
Age of saying first word	Mead	50	15.7		
	Shirley	25	15.0	82	16.00

Table 4, which summarizes the data on comparative development in infancy and early childhood, shows the triplets to be slightly below the norms for single children in most traits. In Table 5, Day's findings on 80 pairs of preschool twins are compared with data on the triplets. These twins represent the entire range of the socio-economic scale, with the average level higher than that of the triplets. It will be seen that the twins are superior to the triplets in age of walking and age of erupting the first tooth. There is scarcely any difference between the birth weights of the twins and triplets.

TABLE 5
COMPARISON OF TWIN AND TRIPLET DEVELOPMENT

Trait	*N*	Twin (Day)	*N*	Triplet
Birthweight	160	5.72 pounds	211	5.70 pounds
Mean age of talking	160	17.00 months	81	13.45 months
Mean age of walking	160	14.90 months	132	16.29 months
Mean age of erupting first tooth	160	8.10 months	87	9.07 months

Because 36 per cent of the triplets are prematurely and immaturely born, it is interesting to compare the development of the triplet group as a whole with that of prematurely and immaturely born singletons. Hess, Mohr, and Bartelme give the mean birthweight for 93 prematurely born boys as 4.11 pounds; for 134 prematurely born girls as 3.91 pounds. Capper, who studied the development of 437 prematurely born children in Vienna, states that they were retarded in all "static functions," beginning with holding up the head. The range of time for sitting alone was from five to 30 months. The range of time for the triplets was from four to 24 months. The prematurely born singletons with birth weights between 2,000 and 2,500 grams began to stand alone at 8 months; those under 2,000 grams at 12 months. The range of standing alone for the triplets was from 7 to 24 months. The age range of walking for Capper's prematurely born children was from 9 to 48 months, with the majority walking between 12 and 24 months. The age of first walking for Brandt's immaturely born group extended from 12 to 36 months and older. The range for the triplets was from 9 to 36 months. The range for erupting first tooth for Capper's immaturely born group was from 6 to 36 months, and the median, 6.65 months. The range for the triplets was from 4 to 20 months, with the mean, 9.07 months. The triplets are superior to the prematurely born singletons in sitting alone, standing, and walking; the singletons are superior for the average age of erupting the first tooth. The general superiority of the triplets in the developmental schedule is due probably to their larger birth weight and greater maturity at birth.

D. ANTHROPOMETRIC MEASUREMENTS OF TRIPLETS[1]

Anthropometric data on the triplets were secured in two ways. The questionnaires asked about the birth weight, present weight, and height; and a battery of anthropometric measurements was made on the tested group.

The present weight was given for 130 triplets, ranging from preschool age to adulthood. These data were checked against the only table that could be found, that of Gray (10) which gave the mean weights and sigmas for a group from infancy to maturity. Gray's study is of the physical development of private school children, hence his sampling is from the higher socioeconomic level. For this reason his norms are higher than those of the general population. As compared with this group the triplets had a low average weight. When checked against several weight charts based on unselected population, the triplets were just a little below the average weights for their various ages.

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[1] The anthropometric measurements were made by Dr. Edith Boyd, Dr. Herman Hilleboe, Dr. Alice Fuller, Dr. Karin Petri, and Miss Ellen Church of the staff of the Institute of Child Wefare of the University of Minnesota.

The anthropometric measurements made on the tested group included dimensions less frequently taken and reported on than standing height and weight. The first problem then, in analyzing this material, was to find reports of the same measurements taken on single children. But normative material for some of the measurements was not to be found in the literature. If the central tendency for a dimension were reported, perhaps the variability of the group or the method of taking the measurement, or again the size, age, sex distribution, and homogeneity of the population were not described adequately. The writer found the norms published by the Iowa University Child Welfare Research Station (14) and those published by Ruth Sawtell Wallis (21) to be the most satisfactory for preschool children. The most satisfactory norms for school-age children were reported in the study of the Stanford gifted children (19). None of these reports, however, included all the dimensions taken in the triplet study; consequently, in some instances the triplet measurements could not be compared with those of single-born children. Another difficulty encountered in using this material was that norms were given only for twelve-month age intervals in the one study and three-month intervals in the other. This lack was especially serious in the preschool age, when growth is rapid and norms are needed for small age intervals. The first step in remedying the defects in the comparative data was to correct the means and sigmas for each dimension, thus making possible approximate norms for each month. The sigma was corrected according to the formula worked out by Joseph Berkson in his study of "Growth Changes in Physical Correlation" (2). Means for each month were obtained by interpolating on a graph constructed from the original normative data. The measurements of the triplets from two to five years of age were compared with the University of Minnesota[2] norms; those between 21 and 24 months and 61 and 83 months with the Wallis norms; and those 7 to 15 years with the Stanford gifted children norms.

Graphs were constructed for each dimension, showing by lines the norms for the mean and plus and minus one standard deviation and indicating the position of each triplet within the various areas by means of dots. Inspection of the graphs showed that in most cases the triplets were in the area of minus one standard deviation and below. They were closer to the normative average in standing height than in any other dimensions. When the anthropometric measurements of 11 sets of preschool triplets were compared with the norms for single-born preschool children (worked out at the Institute of Child Welfare of the University of Minnesota and at the University of Iowa), 32 of the 33 triplets were below these norms. Although the numbers are smaller at the later than the earlier ages, there seems to be a tendency for the triplets to approach the average for single children at about 14 to 15 years.

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[2] These norms were derived from anthropometric measurements made on chidren at the Institute of Child Welfare of the University of Minnesota under the direction of Dr. Edith Boyd.

In Great Britain, Fisher (7) measured the standing height of 146 sets of triplets and of single children from rural districts and from four socio-economic levels in Glasgow. He found the triplets were slightly inferior to the children of the upper socio-economic levels and similar to those of the lower levels. Fisher does not give the socio-economic classification of the triplets or say whether they lived in the country or the city. Since, however, triplets born throughout the British Isles are registered for the King's Bounty, it seems probable that rural and urban children of all classes were included in the group. Fisher's data suggest that the differences between the standing height of triplets and of single children is as great as the difference between single children of the upper and lower socio-economic levels. If the cultural level of his triplet group were known, a more definite conclusion could be drawn. Further studies like Fisher's, comparing triplets and single children in different physical traits, would be valuable for obtaining facts on the physical growth of triplets.

E. SKELETAL DEVELOPMENT OF TRIPLETS

Roentgenograms were made for 10 sets of triplets, for one of which an analysis has been reported by Lund (15). X-rays of the hand and wrist of one set were filmed by Charles D. Flory, then of the Department of Education of the University of Chicago. He found the carpal development of a set of 22-months-old girls to be inferior to the average for 12-months-old children. The triplets were considered "Slower in bone growth than in body measurements." Dr. Rigler, Director of the X-ray Department of the University of Minnesota, made X-ray pictures of the skull, sella, sinuses, mastoids, chest, heart, pelvis, hips, lumbo-sacral spine, shoulders, elbow, wrist, knee, ankle, and feet of the other nine sets. The range of variation for normality in skeletal development is so wide that extreme divergence is necessary for a child to be considered abnormally retarded or accelerated. These nine sets were rated as normal in skeletal development. This did not agree with the anthropometric measurements, according to which most of the triplets were inferior to the single-born children.

F. DENTAL DEVELOPMENT OF TRIPLETS[3]

Dental casts were made for nine sets of triplets ranging in age from two to 15 years. The casts were examined for eruption of teeth, bite, caries, and general development, and measured for upper and lower lengths and widths. Seven triplets had missing teeth; consequently not all the measurements could be made for them. The casts showed caries for all triplets except the two youngest sets. In two sets the eruption of the teeth was retarded for the chronological age.

Findings from questionnaires and dental casts corroborate each other in showing that triplets are slow in dental development. They reveal that retardation in developmental traits begins in infancy and continues at least into the early years of the school-age period.

G. DEVELOPMENT TEMPO OF TRIPLETS

The present triplet group is slower than single-born children in physical and also in intellectual development. In anthropometric measurements the older triplets are somewhat nearer the norms for single children their own age than are preschool triplets, though the trend is not equally marked in all traits. In mental test ratings and language development, also, school-age triplets approach the norm more closely than do the younger children. On the basis of the relative superiority of the older group in these three types of development, and of the more nearly normal height and weight of adult triplets than of child triplets, the hypothesis of developmental lag may be proffered. A great deal more information on a larger group of triplets is necessary to raise this hypothesis from its present speculative status. Longitudinal and cross-section studies of triplets would show whether there is a typical speed or tempo of development and whether triplets tend to develop less rapidly at earlier ages and more rapidly at later ages than single children whose developmental tempo is relatively more accelerated at earlier ages.

H. SUMMARY

The present study is based on questionnaire data concerning 229 sets of triplets and a more detailed examination of 29 sets. The preponderance of females in the group is in accordance with the sex ratio for multiple births.

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[3] The dental casts of the triplets were made by Dr. Joseph T. Cohen, staff member of the Institute of Child Welfare, University of Minnesota.

The majority of the triplets are from the lower socio-economic groups, the fathers of 54 per cent being farmers.

Parents of triplets are older at the time of the triplets' birth than parents in the general population. Frequency of tripleting varies directly with the age of the mother. Triplets tend to come in families of more than average size. In order of birth, the position of the triplets in the family is nearer the last than the first. Evidence of the hereditary nature of tripleting is found in the fact that a large percentage of the families reported other multiple births in the immediate family or in their ancestry.

Thirty-six per cent of the triplets were prematurely born. The mean birth weight for 210 triplets was 4.84 pounds, about two pounds below the average for unselected singletons and less than one pound below that for twins.

In the major developmental traits of the period of infancy such as walking and eruption of the first tooth, the triplets were slightly below the norms for single-born children. Triplets were inferior to single-born children in anthropometric measurements such as weight and height. There was a tendency for the older triplets to be nearer than preschool triplets to the average for single-born children of their respective ages.

Comparison of the physical development of triplets with twins and singletons prematurely born shows that the multiple-born have the greater developmental lag. Evidently then, prematurity is not the only cause of the physical developmental lag of twins and triplets.

These findings are for the subjects of the present study only and are not to be considered as generalizations for all triplets.

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FETAL REACTIVITY TO TONAL STIMULATION: A PRELIMINARY REPORT *

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The study of human fetal sense modalities in utero has come a long way since Preyer (2) made the statement in 1885 that infants before their birth, with a "probability bordering on certainty," had no auditory sensitivity at all. In 1925 Peiper (1), using a "loud and shrill" automobile horn as the stimulus and fetal movement as the index of reactivity, obtained some responses, but cautiously concluded that the results of his experiment were ambiguous. More recently Sontag and Wallace (3, 4) and Sontag and Richards (5) have produced evidence that the fetus in utero is responsive to a 120-cycle vibratory stimulation applied to the maternal abdomen, responding by cardioacceleration and by muscular activity in a way which is suggestive of a fetal startle pattern.

In this connection, it is pertinent to consider the fact that infants born prematurely are responsive to sound stimulation. It may be assumed, therefore, that the seven- or eight-month fetus possesses the necessary equipment for hearing. But, within the uterine environment, does the fetus hear?

The possibility that the human fetus in utero is capable of receiving and responding to stimulation which outside of the mother's abdomen is perceived as sound, opens an intriguing field of inquiry. When the vibratory stimulus used is evaluated as sound stimulation and calibrated for its sound qualities, such as tonal range and intensity, do we detect a differential response in the fetus in utero? Are sounds in the everyday external environment, such as music, the dropping of heavy objects, the sound of automobile horns, etc., perceived by the fetus? How does the fetus' sensitivity to vibratory stimulation change with age? Another crucial question—and one which previous studies involving vibratory stimulation have failed to settle—is this: to be effective in arousing fetal response, must vibratory stimulation be applied directly to the mother's abdomen, i.e., contiguous to the tissue of the mother's body? Or will vibration transmitted through air space be further transmitted through the mother's body to the fetus?

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[1] From the Samuel S. Fels Research Institute, Yellow Springs, Ohio. The research reported here was done early in 1942 and was interrupted by the war emergency. Although the full study is not completed, positive results indicate the desirability of this preliminary report.

In an attempt to answer some of these questions, the following procedures were initiated.

PROCEDURE

Our experimental procedure involved the weekly presentation of tonal stimulation to gravida during the last 2½ months of pregnancy. The tones, relatively pure in character, were generated by a Jackson Audio Frequency Oscillator, amplified by a Setchell-Carlson Amplifier Model 13-B, and brought to the maternal abdomen through a Utah G8P speaker resting on a rubber baffle centered over the head region of the fetus. Thus any vibratory stimulus reaching the fetus would have to pass through an air space and could not be interpreted as being conducted through physical contact with the mother's body.

Fetal cardiac change was used as an index of fetal reactivity. Fetal heart sounds were picked up by means of a Brush microphone strapped to the maternal abdomen at the point where the sound was loudest, suitably amplified, and recorded by means of an ink-writer on a moving tape. A switch broke the microphone circuit as it made the speaker circuit, thus avoiding damage to the recording equipment.

During the weekly experimental sessions, each of which involved the presentation of approximately 10 tonal stimulations, the subjects rested in bed in a relatively soundproof room which the experimenter entered only for the purpose of adjusting the microphone. The frequencies used ranged from 20-12,000 dv/sec, and were varied systematically. Each stimulation lasted five seconds and was preceded by a warning about three seconds before. In the earliest work this warning was verbal; later a small signal lamp was substituted. In the present analysis, we shall consider only frequencies of 6,000 dv/sec and lower, as intensity fell off rapidly above that point with our present apparatus.

ANALYSIS

Ten-beat intervals were marked off on the records in both directions from the stimulation, measured as to length, and converted by means of a table to beats per minute. This analysis is therefore in terms of beats per minute of 10-beat samples. The 10-beat periods were continuous.

Figure 1 presents three individual curves for Subjects *F*, *H*, and *I*, and a composite curve for 73 stimulations conducted on these three subjects plus a few observations on a fourth subject, Subject *J*, who had too few stimulation sessions to permit treating her individual data statistically. It will be seen in each of these curves that a high fetal cardiac rate obtains shortly

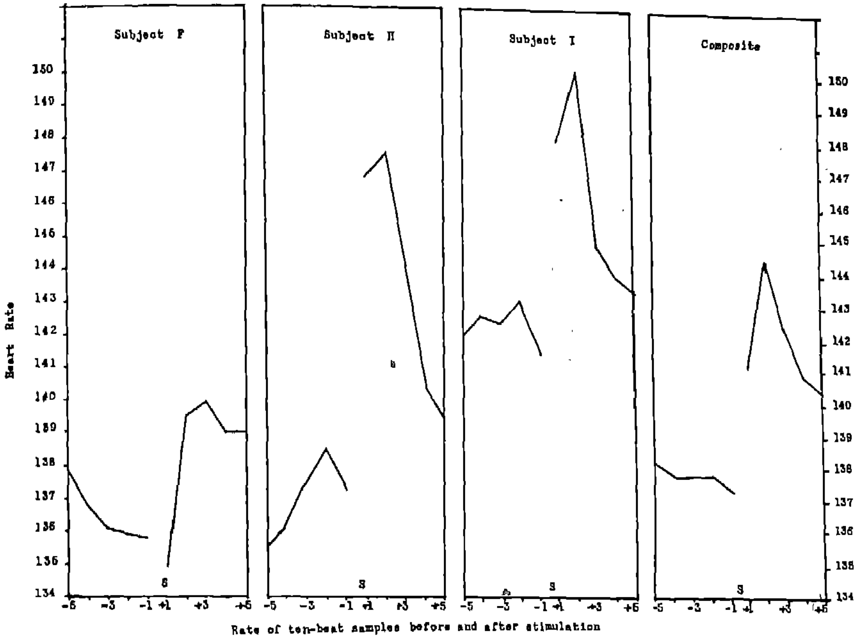

FIGURE 1
FETAL HEART RATE IN THREE INDIVIDUAL SUBJECTS AS A GROUP BEFORE AND AFTER TONE STIMULATION

after stimulation. The critical ratio of the difference between the means of the five consecutive 10-beat pre-stimulation intervals and the three consecutive post-stimulation intervals (when the effect of stimulation was at its height) was computed for each of the subjects. Table 1 presents these data, together with means and sigmas. Table 2 presents the mean pre and post-

TABLE 1
THE SIGNIFICANCE OF POST-STIMULATORY CARDIOACCELERATION

	N	Pre-stim. mean	Sigma$_{dist.}$	Post-stim. mean	Sigma$_{dist.}$	*CR*	Chances in 100*
F	35	136.6	5.10	138.1	4.47	1.97	98.0
I	20	142.4	6.68	147.3	10.92	2.68	99.7
II	14	137.2	8.81	146.4	6.67	7.77	99.9+
Composite	73	137.5	7.22	142.5	8.37	5.99	99.9+

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*That, if this experiment were repeated under the same conditions, differences would be found in the same direction.

TABLE 2

Frequency range (dv/sec)	N	Pre-stim. mean	Post-stim. mean	*Diff.*
20- 125	12	142.2	147.1	+4.9
200- 400	12	137.4	143.2	+5.8
500- 800	11	137.4	142.1	+4.7
1,000-2,000	11	139.3	144.2	+4.9
4,000-5,000	8	141.3	143.3	+2.0

stimulation heart rates broken down in terms of stimulation frequency. Critical ratios for these differences were not computed because of the small number of cases.

DISCUSSION

Four explanations of the phenomenon of cardioacceleration visible in each of the curves appear plausible. We shall discuss each of these in turn.

1. Could the observed cardioacceleratory response of the fetus be due to maternal stimulation with resultant humoral changes in the mother, which are then passed on through the placenta to the fetus to serve as a secondary stimulus? The four graphs in Figure 1 show that the cardioacceleratory effect of the stimulation reaches maximum in the second 10-beat period following stimulation, or about 11 seconds after the onset of stimulation. The rapidity of this response eliminates the possibility of its being a maternal stimulus transmitted secondarily to the fetus through passage of newly liberated blood components into the fetal circulation. Any endocrine or other products released into the mother's blood stream as a response to stimulation could not possibly be circulated to the placenta and through the fetal circulation in so little time.

2. If the mother knew far enough in advance just when the stimulation was coming, is it conceivable that her emotional response might occur early enough to permit humoral changes to reach the fetal circulation? To test this possibility, we used suggestion of stimulation during 15 of the experimental sessions. On these occasions warning of impending stimulation was given, but no tone sounded. There was no significant change in fetal heart rate after such "suggestions." This fact does not rule out the possibility of a *delayed* fetal cardioacceleration due to the process cited above, but it does eliminate the possibility that the cardioacceleratory effect as demonstrated in this study is the result of humoral changes in the maternal organism.

3. Could the observed fetal cardioacceleration be the result of mechanical stimulation caused by tensing abdominal muscles as part of a maternal startle response to the stimulation? No overt startle responses on the part

of the mothers were noted during the study, and no mother reported being startled by the sound. Ample time was allowed to permit relaxation before each stimulation, and warning of impending stimulation kept the sound from being unexpected. In addition, the baffle concentrated the sound on the maternal abdomen and reduced the intensity reaching the maternal ear. These facts make it appear unlikely that the fetal response stems from *any* maternal reaction, either physical or chemical.

4. Finally, is the cardioacceleratory response of the fetus a direct response to a stimulus which, evaluated externally as sound, is transmitted to the fetus via the maternal tissues and/or fluids? In the light of the above discussion, this appears to be the logical explanation of the observed results.

Table 2 indicates that the cardioacceleratory effect shown in the curves is distributed over the full range of frequencies used, and is not the property of any narrow band. The problem of mapping the limits of fetal tonal sensitivity is therefore opened for future investigation.

By referring to Figure 1 it will be seen that the cardiodeceleration precedes cardioacceleration for Subject *F*. This is in contrast to the direct acceleration shown in the other curves and is worth comment. Sontag and Richards (5, p. 49) have interpreted fetal cardioacceleration following vibratory stimulation as an aspect of a fetal startle response. It is well known that the cardiac response in the human adult startle pattern involves a momentary deceleration followed by acceleration. It is possible that the same pattern obtains in the fetus, the deceleration in Subjects *H* and *I* taking place during the five-second stimulation period and thus not visible in our records, while for some reason not now apparent the deceleration in Subject *F* lasted beyond the stimulation period. This is a point which requires further investigation.

CONCLUSIONS

The experimental data presented here indicate that the human fetus in utero is capable of perceiving a wide range of tones. This tone sensitivity is such that tones produced by an amplifier loud speaker arrangement and transmitted through the air to the mother's abdomen elicit a fetal response. Whether such tonal perception is accomplished by means of the fetal auditory apparatus or represents a vibratory perception sense of other parts of the body, has not been established. It may or may not be proper to speak of "fetal hearing." Response to tonal stimulation is expressed in sharp body movements and cardiac acceleration.

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CHILDREN'S AUDIOGRAMS IN RELATION TO READING ATTAINMENT: I. INTRODUCTION TO AND INVESTIGATION OF THE PROBLEM*[1]

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A. INTRODUCTION TO THE PROBLEM

Reading abilities have occasioned much conjecture, discussion, and scientific research the past 30 years. Certain factors associated with success or with failure in reading attainment have been isolated and subjected to close inquiry. Consequently, the teacher of today has at her command much to help her in guiding the learning-to-read process. She has much to help her detect difficulties that arise for many children in spite of carefully selected materials and methods of instruction; and much to help her provide remedial instruction to overcome difficulties and disabilities. Still, knowledge of factors associated causally with the reading process is far from complete.

Among the factors which may be contributory causes of success or failure in reading and toward which little scientific attention has been directed are the auditory. Seemingly, such factors are not so amendable to investigation as certain other factors. Sufficient information has accumulated however to indicate the possibility that hearing may play an important part in reading development. For these reasons the study which this paper reports represents an attempt to explore one of the auditory abilities—acuity of hearing—in relation to reading attainment.

1. *Hearing and Speech*

To attempt to describe the manner in which the organ of Corti functions or how the nerve impulses resulting in the sensation of hearing are transmitted would involve much that is theoretical. No one theory in entirety

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can be sustained by unqualified evidence, or be as conclusively refuted; so it seems just as well, particularly since this study is in no way concerned with the neurological process of hearing, to omit any discussion of the several theories. However, there are certain generally accepted properties of hearing with which this study is concerned and which will be mentioned briefly.

The human ear responds to pitch which, in a complicated manner, and within limits, is dependent upon frequency; and to loudness which, with the same qualifications, is dependent upon intensity. "Pitch is the subjective quality of a sound which determines its position in a musical scale"—; and "loudness is that subjective quality of a sound which determines the magnitude of the auditory sensation produced by that sound"—(2, pp. 9-10). It responds to sounds whose frequencies range from 20 to 20,000 cycles, or for some individuals over 11 or 12 octaves. It can distinguish *as different* some 550,000 different sounds (32, p. 75). It "responds to air vibrations whose amplitude is hardly more than molecular in size; also,—without damage, to sounds of intensity ten million times greater"—(73, p. 280). The ear is most sensitive to sounds somewhere between the 1,000 and 3,000 frequencies. At the point of relatively greatest sensitivity one ten-thousand-million-millionth watt of power will produce enough pressure power to produce a "just audible sound" (68, p. 85). As put by Conway (17, p. 36), a change in atmospheric pressure by one billionth of its total value is sensed by the ear. To sounds below and above this frequency region (1,000-3,000) the ear is relatively less sensitive, however. It is this extreme sensitivity of the normal ear to a wide range of frequencies and intensities that accounts for its more or less automatic accommodations to speech sounds.

2. *Voice and Speech*

The principal physical mechanisms for speech are the breathing system, consisting of the bony framework of the thorax, the lungs, the respiratory muscles, air passage ways, and the nervous system; the tone-initiating system which includes the breathing system and the larynx, vocal cords, and laryngeal cartilages; and the tone modulating system made up of the laryngeal, paryngeal, oral, and nasal cavities (82, Ch. IV). For speaking, the lungs supply explosives of air, streams of which pass in and out of the vocal cords, vocal passages, cavities of the nose and throat, tongue and lips. The vocal cords are formed by a straight muscular ledge on either side of the larynx, and when streams of air are forced through from the lungs, their movement starts a train of sound waves through the vocal passages. In the vocal passages these waves are "modified by certain resonant characteristics," so that complex air movements or sound waves finally emerge from the mouth as speech sounds. Vowels, semi-vowels, diphthongs, and transitionals are produced in this manner. The unvoiced consonants are produced by air from the lungs forced to pass over sharp edges in the mouth or through small openings while the vocal cords are in a passive state. Voiced consonants are produced by a combination of these two processes.[3]

In general, the vowel sounds "are characterized by continuous wave trains formed in the throat and passing through open passages." Diphthongs are combinations of two vowels. If the mouth is in a position to say *ē*, for example, and without interruption is changed to *ū*, *e͞w* results. Transitionals, *w*, *y*, and *h*, represent a particular way of beginning the vowel sounds. The semi-vowel sounds are begun in the vocal cords just as the vowels, but instead of being allowed to escape the mouth are stopped by the tongue or lips. The voiced and unvoiced consonants are further divided into stop consonants and fricative consonants. The unvoiced stop is formed by a rush of air waves formed in the mouth and forced through small openings, then suddenly released by opening the mouth, as the *t* sound in *tap*. The unvoiced fricative is formed in the same manner, but the air allowed to escape a small outlet, as the *f* is released by holding the lower lip to the edge of the upper teeth. The voiced stop and fricative are produced if a sound from the vocal cord is produced at the same time that the mouth is in a position to make an unvoiced sound. Thus *f*, an unvoiced fricative, becomes *v*, a voiced fricative, if the mouth is formed to say *f* and a sound comes from the vocal cord; or *k*, an unvoiced stop, becomes *g*, a voiced stop, if sound comes from the vocal cords (32, pp. 4, 5).

The production of speech sounds is not so simple as this brief description of the mere physical mechanism might suggest. When speech sounds leave the mouth of the speaker their wave forms and overtone structures are quite complex. The physical mechanism produces rather regular puffs of air which are modified as they pass through the various resonating cavities—the sinuses, the nasal cavities, and the cheeks. The modification taking place accounts for a great deal of intricate overtone structure of speech sounds which, in turn, accounts for much of the quality as well as the intelligibility of speech sounds. As one sound converges with another many different frequencies and amounts of intensity are called into play and the shifts both in frequency and intensity take place in fractional parts of a second. The ear receiving the sounds must be able, for accurate interpretation, to make almost instantaneous adjustments even in ordinary conversation to a range in intensity[4] of approximately 1 to 500,000 and to a range in frequency to some six or seven octaves (32, p. 75).

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[3] There are various classifications of English voice sounds, depending largely upon the use to be made of the classifications. The one given here, based on the manner in which the sounds are formed, is the one used in the Bell Telephone Laboratories for engineering work.

Much of the credit for the information we have regarding the complex frequency and intensity patterns of speech sounds is due to the experimental work in the Bell Telephone Laboratories. In these laboratories, about 25 years ago, an apparatus known as a condenser transmitter was designed for the purpose of recording and studying speech sounds. This transmitter converts sound waves into electrical waves which are amplified and sent into an especially designed oscillograph where they cause a tiny ribbon to vibrate. A moving film then photographs the movement of the ribbon. An intensive study of many such films has made possible a detailed analysis of many speech sounds (32, pp. 26-27).

The vowel sounds, due probably to the very nature of their production, apparently lend themselves to a more exact analysis of intensity and frequency composition than consonant sounds. Although the characteristics of the spoken vowel vary within limits from one individual to another and with the mood of the speaker, photographs of speech waves have established certain facts. Usually there is a rise in pitch as the spoken vowel progresses, and a rapid growth in intensity—"lasting about .04 second during which all of the components are quickly produced and rise to nearly maximum amplitude"; a middle period lasting about .165 second; then a gradual decline lasting about .09 second (32, pp. 54-55). There is a tendency for longer or shorter durations for long and short vowels. The records show that in addition to the fundamental frequency of the vowel there are fairly well defined resonant frequencies which are "independent of the pitch of the fundamental" (88, p. 40). These resonating frequencies occur in the low frequencies and high frequencies and in low and high scattered frequencies (19). In general, the long and short vowel fundamental and components occur in the frequency range from 200 to 3,000. At least this is the range that is of the greatest importance in vowel articulation, although the strength of some of the components at frequencies as high as four or five thousand cycles suggest that a broader range is sometimes used in voicing the vowel sounds (89).

While more study has been made of vowel sounds than of consonant sounds, probably because of their "tonality" and the less complicated series of events taking place in their production, several analyses of consonants have been made. From these it can be said, in general, that consonants are of shorter duration from the standpoint of both production and dissipation than are vowels; that their sound waves are more directional and more easily masked than those of vowels; that their characteristic frequencies are higher and they carry less intensity. By means of articulation tests, Steinberg (89, p. 128) reports that the frequencies of greatest importance for the intelligibility of the consonants, and nasal consonants or semi-vowels, are from 500 to 4,000; stop consonants, 750 to 5,000; and fricative consonants, 1,000 to 8,000.

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[4] The ratio of 1 to 500,000 is the approximate ratio between the faintest speech sound used in uttering *th*, as in *thin*, and the peak value of the loudest speech sound, *aw* as in *awl*.

In spite of the varying degrees of power carried by the fundamental vowel and consonant sounds that are occasioned by syllable accent, by their position in the word and sentence, and by the emphasis given them by individual speakers, the variation for a given sound is within limits. A type of transmitter condenser is used for determining the relative, not absolute, amounts of power in the basic speech sounds. The power in the faintest sound is used as a basis for comparison. From results of these studies it is learned that vowels are the most powerful sounds, that semi-vowels and the unvoiced fricatives *sh* and *ch* are next with comparable power, and that least in power are the remainder of the fricative and stop consonants. The sounds show variations not only in average phonetic power, but also in peak power.[5] For example, the ratio of phonetic power between *th* and *aw*, the faintest and loudest speech sounds, is 1 to 620; the ratio between the faintest power in the production of *th* and the peak power in the production of *aw*, is approximately 1 to 500,000 (2, p. 11) (32, p. 74).

As the reference to speech power—average and peak—suggests, the power in speech sounds is distributed in a very complicated manner between the fundamental frequency of a speech sound and its components. The amount carried by each varies greatly from sound to sound. It can be readily seen that the ear receiving the speech waves, even in the simplest conversation, is receiving trains of highly complex wave forms. In frequency it must be able to adjust to between six or seven octaves in fractional parts of a second, and in intensity to ratios that are phenomenally great. It must be able to distinguish between sounds that have a high degree of similarity in frequency, in intensity, and often in both. For interpretation it must be able to hear sounds of different frequency and intensity that are produced simultaneously as well as others that are produced almost simultaneously.

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[5] Phonetic speech power is the maximum value of the average speech power of 0.01 second intervals of a vowel or consonant sound. Peak speech power is the maximum value of the instantaneous speech power over the time interval considered.

The complexity of speech sounds leads West to say, "We have learned that English speech is patterned more definitely after the requirements of the organs producing it than after the organs receiving it; that English speech puts the greatest premium upon the reception of the frequencies to which the ear is the least sensitive . . ." (105, p. 574). West is referring here to the fact that in general vowel sounds are more easily heard than consonants, but are relatively less important for the interpretation of speech. Crandall (18, p. 223) says that vowels are the determining factor in the energy distribution of speech but that the consonants are the determining factor in importance to articulation. Stanley (88), Beatty (4), and Conway (17) say much the same thing: that low frequency sounds emit the power or energy, but that the accompanying high frequency sounds determine intelligibility and understanding. Filtering out the lower tones of a voice leaves an unpleasant sound but an intelligible one, while filtering out the higher tones leaves a pleasant but unintelligible one.[6]

Factors other than frequency and intensity also differentiate consonants and vowels. The time necessary for uttering a vowel is approximately 0.3 second, according to Watson (103, ch. V), and for the preceding and succeeding consonant 0.05 second each. Also, since the consonant carries less energy it is dissipated before it has traveled as far as the vowel.

It should be kept in mind that these physical phenomena of speech as well as of hearing have been carefully explored in laboratories. The neurological phenomena concerned with the discrimination, memory, and association of sounds are still largely in the realm of the unknown and a study of speech or hearing is limited by an inadequate knowledge of them.

3. *Problems With Which This Study is Concerned*

The main purpose of the study is to determine possible relationships between audiograms[7] and achievement in reading among children of an ordinary school population at the elementary school level. Basic to the problem, of course, is the relationship that exists between the aural and printed speech symbol. The child enters school with his means of communication largely dependent upon speech and hearing. Now, with the presentation of printed symbols, his knowledge of speech sounds must serve as the framework upon which this new mode of communication is built. It is certainly within the realm of possibility that children *do* enter school who do not hear the short *e* and short *i* as different because their hearing is not keen enough, or cannot hear *w* and *wh* as different, or who have never heard the *v* sound. To a child with incomplete hearing for the high frequencies, *velvet* could very easily sound as if it were *felfit.* Note the very slight difference in sound between *monster* and *moniter,* or between *aural* and *oral.* Since so many of our English speech sounds are difficult to distinguish, even when the hearing is acute, it seems reasonable to assume that even slight hearing loss might render distinction more difficult. And for a child whose hearing is not keen enough for him to hear any difference in *big* and *beg,* although he may know the difference in meaning when he hears them in their functional relationships, learning the two different printed symbols may have complications that it does not have for the child who can hear the difference.

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[6] Mention should be made of the fact that relatively greater importance of the high frequencies as compared to the low for interpretation of speech sounds is not universally accepted. The literature regarding speech and hearing carry an abundance of an opposing point of view.

[7] "An audiogram is a hearing loss-frequency graph or a per cent hearing-frequency graph" 2, p. 11).

While a number of reading specialists admit the possibility of a relationship between various hearing abilities and reading progress there is little experimental evidence to lend support to the possibility.

In 1921 Filds (26, p. 307) investigated the auditory fields of 26 non-readers by giving tests for determining auditory discrimination and retention. She reported that "the non-readers as a group showed a lowering of auditory power."

In 1926 Hincks (53) reported 16 case studies of extreme reading difficulty. In an investigation of their auditory characteristics she used tests for auditory memory which required the repetition of digits and sentences; and the Seashore test for pitch discrimination. Eleven of the 14 were below normal in pitch discrimination. Defects other than auditory were found in most of the 11 cases, so Miss Hincks concluded that auditory defects were only one causal factor in poor reading.

Monroe (69), in *Children Who Cannot Read,* reports an investigation made of the auditory fields of 32 non-readers and 32 controls. She found that the controls made better scores on auditory discrimination tests than the non-readers. Pairs of words similar in sound were used for this test. On the sound blending tests she again found the controls better. The whispered voice and watch-tick tests were used to determine acuity, and although only two of the non-readers were discovered with impairment, she concluded that poor auditory acuity, lack of precision in the discrimination of speech sounds, and inability to reproduce correctly the temporal sequence of sounds, may impede progress in reading.

Bond (10), in his study of auditory and speech characteristics of poor readers, found significant differences in favor of the good readers in auditory acuity as determined by an individual audiometer; in ability to blend, in memory of rhythm and digits, and in auditory discrimination and perception, by means of self-made tests.

Attention might be called to the fact that Filds and Hincks did not test for acuity; Monroe used the whisper and watch-tick tests for acuity. Bond used the individual audiometer and averaged hearing loss for all the tones tested.

Young (112) studied the relation between hearing comprehension and retention and reading comprehension and retention by having 4th, 5th, and 6th grade pupils reproduce material that was read orally to them and material that they themselves read silently. He says, "The findings suggest possible inter-relation between reading comprehension and retention, and hearing comprehension and retention."

The studies of Wilson and his colleagues (107, 108, and 109) and those of Gates and Bond (48) concerned with the prognostic value of certain reading readiness tests in terms of their sub-tests are suggestive, by implication only, as relating to hearing or hearing difficulties. These investigators grouped the sub-tests of several tests into certain categories as, tests of abilities with letters and phonic combinations, measures of mental ability, psycho-physical measures, and measures of personality traits. They all report the correlation between success in reading and abilities with letters and phonic combinations to be higher than with any of the other categories.

These studies suggest that various hearing abilities such as pitch discrimination, tonal memory, ability to hold sounds in mind and reproduce them, and acuity of hearing may all be factors related to the child's success in reading; but a study of no one of these abilities seems to have been the major purpose of any intensive investigation.[8]

Beginning early in this century several studies were made to investigate the relation between hearing acuity and general scholastic achievement. Since the advent of the group audiometer, which came on the market in 1926, the number of such studies has greatly increased. The findings in many instances have been conflicting. Lack of agreement in findings is natural since the group audiometer is not an instrument of precision. At best it is only an instrument for screening out the poorest hearers and, according to Ciocco

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[8] *The Encyclopedia of Educational Research* devotes two columns to visual factors, but none to auditory. However, reference is made several times to the auditory in the section dealing with the research in the field of reading.

(15, p. 2), it often fails even in this. Besides, the testing procedures have not been uniform. The criterion for hearing loss has varied from 3 to 12 sensation units, hence results are hardly comparable (74, p. 10). There are three studies, however, the findings of which should probably be summarized because they seem to have been more carefully conducted and reported than other available ones: that of Waldman, Wade, and Aretz (101), based on group and individual audiometer tests; of Madden (65), who used the group test; and the study of Conway (17), who used an individual audiometer test.

Waldman, *et al.* gave the group audiometer test to 1,079 Philadelphia school children in Grades 4 through 8. They found 63 children with 9 or more sensation units loss[9] in one or both ears. Achievement of these 63 is compared with the achievement of 63 with less than nine sensation units loss. The poor hearers, on the basis of the New Standard Achievement Test, were found to be almost a year and a half below the good hearers. Further sorting of the 1,079 by eliminating children with defects other than hearing assumed to be associated with learning differentiated a group of 552 that were tested for hearing loss and educational achievement. Thirty-six with one ear markedly defective were found to be about one-half year retarded in educational achievement. Seventeen with marked defects in both ears were found to be slightly more than one year retarded.

Madden, who tested 892 school children, Grades 3 through 6, found 46 children with 15 or more sensation units loss in one or both ears. The hearing loss was verified for these 46 by means of an individual audiometer. This group was paired with normal hearers on the basis of age, sex, and race. As a group the poor hearers were found lower in intelligence quotients by 6.42 points. The Pintner Rapid Survey Intelligence Test was given to another group in Grades 4, 5, and 6. The results were analyzed for children having nine or more sensation units loss in relation to children having less hearing loss. The difference in intelligence quotients in favor of the better hearers was 7.86. Madden states that only when the hard of hearing are studied as a group is the difference in intelligence quotient significant. As to retardation, he concluded that when factors of intelligence, parents' occupation, age, sex, and race were held constant the hard of hearing were no more retarded than normal hearers.

Conway, a research assistant at the University of Toronto, with the aid of a member of the physics department, constructed his own audiometer for testing hearing. It was designed to test hearing for 62, 125, 250, 500, 1,000, 2,000, 4,000, 6,000 8,000 and 12,000 cycles. He tested 1,000 public school children, Grades 5 to 8. An average loss of 10 decibels in either ear was taken as an arbitrary dividing line between the normal and hard of hearing. Loss on all 10 tones was averaged, presumably. He found 7.9 per cent of the children with unilateral loss of 10 or more decibels, and 2.7 per cent with bilateral loss of as much. Nine hundred thirty-three of the thousand had normal hearing. Sixty-seven of those with hearing loss showed loss greater than 10 decibels, 12 greater than 20, and 4 greater than 40. Retardation based on ages rather than tests showed no retardation among children with *0* hearing loss; 2.3 months for children with 10 per cent loss; 12.2 months for children with 20 per cent loss.

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[9] In their study nine sensation units were taken as the amount of loss differentiating the poor and good hearers.

It will be noted that all three of the studies cited report a positive relationship between loss of hearing and retardation, but questions of the reliability of the findings might justifiably be raised. Ciocco (15, pp. 1-2), with an individual audiometer, retested about 700 children who had previously been given a group audiometer test and found 71 per cent of those having nine or more sensation units[10] loss on the group audiometer to have "good hearing"; and 5 per cent of the children with less than six sensation units loss as shown by the group audiometer to have some hearing impairment, and one child to be almost totally deaf in one ear. The study by Waldman was based on impairment or no impairment as differentiated by a group audiometer. Only 46 of Madden's cases had the benefit of an individual audiometer retest. Conway used an individual audiometer that he had constructed himself. While the results he obtained, approximately 10 per cent with hearing loss, sound reasonable, the accuracy and precision of the home-made instrument seem problematic. Neither was retardation determined by standardized tests in his study.

The incidence of hearing impairment, *per se,* among school children is still largely a matter of opinion although several million school children have been tested in the past 18 years. During the school year 1926-27, the first year the 4A audiometer (group) was available, 250,000 children were tested, and various reports gave from 8 to 12 per cent defective (32, p. 213). In 1930 a study (92) made of 1860 pupils in the Washington, D. C. and Hagerstown, Maryland, schools reported 23 per cent as having loss, but only 1.6 per cent with severe loss. The White House Conference (106, pp. 4, 6) reports an estimate of 3,000,000 school children with impaired hearing. This report gives only one handicap—malnutrition—with greater incidence than hearing impairment. Results of tests given to 818,274 school children during the school year 1937-38 revealed per cents varying from 0.8 in the Pelham, N. Y., school to 21.4 in the Johnson City, Tennessee, schools (39). In 1940 the American Society for the Hard of Hearing (40) again published reports of tests for the year 1938-39 involving 1,871,111 school children. Again the incidence of loss varied widely. It is estimated (99, p. 4), by averaging the results of thousands of tests, that close to 7 per cent of the school children of the nation have impaired hearing. Apparently, no routine survey of a total school population employing a clinical instrument for detecting the amount of hearing loss has been undertaken to substantiate the estimate.

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[10] The term is used synonymously with decibel.

As the paucity of scientific information regarding children's hearing abilities became increasingly apparent, problems thought to be concomitant with a study of audiograms in relation to reading achievement were incorporated in the present study. The scope of the problem thus became a study of audiograms in relation to (*a*) total reading achievement, (*b*) certain areas of reading achievement, (*c*) age and sex, (*d*) economic status, and (e) external otological examinations.

B. INVESTIGATION OF THE PROBLEM

1. *Materials*

It was assumed that a study based on analysis of audiograms[11] in connection with factors suspected of being associated with reading progress should entail precise measurements and standardized procedures within the limits of practicability. The audiometer to be used for determining audiograms should be relatively free from "internal vice." While its reliability is of first importance, ease of operation is likewise desirable. It should be designed for individual testing and should cover a wide frequency range. It was also clear that it was preferable for one person to give all of the hearing tests, that the testing should be done in a quiet place, that a uniform procedure for determining limen should be employed; and that rapport between the tester and subject was of prime importance. It was further assumed that it would be wise for one doctor to make the otological examinations. It was taken for granted that reading attainment should be measured by standardized reading tests. Finally, it was deemed essential that study include a total school population.

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[11] "An audiogram is a hearing loss-frequency graph or a per cent hearing frequency graph." See American Standards Association, *American Standard Acoustical Terminology* (2, p. 11).

Hearing loss is defined as: "The hearing loss of an ear at a given frequency is the ratio of the threshold of audibility for that ear to the normal threshold of audibility, at the same frequency. It is expressed in decibels" (2, p. 10).

The audiometer chosen for the testing is known as the *Maico D 5.* It is a fixed oscillator type which "produces audio-frequency notes directly by means of an oscillating tube, transformer, coils and chokes." It provides tones at 128, 256, 512, 1,024, 2,048, 2,896, 4,096, 4,792, 8,192, and 11,584 cycles. The intensity is calibrated in units of five decibels.[12] The operator controls frequency and intensity by means of dials on the front panels of the instrument. On the front panel there is also a tone interrupter for his use. The receiver which the subject holds to his ear is concave and large enough to fit over the pinna. It is made of a rubberized substance that is not uncomfortable to the ear even when held firmly. There is a pendant push button at the end of a cord by means of which the subject can signal his responses. The instrument is electrically operated.

Before the testing for the study was begun, the particular instrument that was to be used was sent by the manufacturer to the National Bureau of Standards at Washington where tests were made to determine whether or not it met the requirements of the American Standards Association. These standards specify the margin of error acceptable in range of frequency, control of intensity, accuracy of frequency, purity of tone, extraneous noise, and audiometer calibration. The instrument complied with the specifications in each instance.[13]

The external otological examinations were made by the college[14] resident physician. Conditions of the throat, ear canals, eardrums, nose, and teeth were recorded as: *tonsils,* 1) in and throat normal, 2) out, but otherwise normal, 3) regrowth, 4) imbedded, 5) chronic infection, congestion or both to extent child advised to see a throat specialist, 6) large, (3+) but not infected or congested; *ear canal,* each ear separately, 1) normal, 2) acute infection evidenced by purulent discharge and redness, 3) congestion, 4) subsiding or recent infection evidenced by dried exudate, 5) hidden by wax; *eardrums,* separately, 1) normal, 2) questionable evidence of old infection—drum dull but landmarks visible, 3) definite old infection—scar, perforations, landmarks not visible, 4) recent infections evidenced by redness and/or congestion, 5) combination of old and recent infection or questionable and recent, 6) not seen for wax; *nose*, 1) normal, 2) acute infection—exudate, muco purulent or mucoid discharge, nasal drip, congested turbinates, acute rhinitis, 3) chronic or subsiding infection—dried purulent exudate, muco or mucoid secretion, turbinates boggy and hypertrophied, 4) obstructions—hypertrophy of turbinates, septrum deviations, adenoidal facies, mouth breathing, 5) combination of obstruction and infection; teeth, 1) no caries, 2) caries.

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[12] The physical definition of the term is: "The decibel is one-tenth of a bel, the number of decibels denoting the ratio of two amounts of power, being 10 times the logarithm to the base 10 of this ratio (2, p. 6). However, when referring to hearing tests a decibel is frequently defined as "a just perceptible difference in loudness." Sensation Unit (SU) is used interchangeably with decibel in this sense.

[13] Letter from the National Bureau of Standards dated March 4, 1940. The Bureau was also kind enough to re-check the instrument after the hearing tests had been completed and reported—letter dated June 27, 1941—that it had remained well within the specifications.

[14] State Teachers College, Farmville, Virginia.

The reading tests used for determining reading status for children in Grades 2 through 6 were the reading divisions of the Progressive Achievement Tests, Primary Battery for Grades 1, 2, and 3 and the Elementary Battery for Grades 4, 5, and 6, Form A, 1937 Revision (12 and 13). These tests were used for Grades 2, 3, 4, 5, and 6. In the Primary Battery the reading test is divided into Reading Vocabulary with the subdivisions, (*A*) Word Form, (*B*) Word Recognition, and (*C*) Meaning of opposites; and Reading Comprehension with the subdivisions, (*D*) Following Directions, (*E*) Directly Stated Facts, (*F*) Interpretation. The Elementary Battery has essentially the same divisions. Reading Vocabulary includes, (*A*) Word Form, (*B*) Word Recognition, (*C*) Meaning of opposites, (*D*) Meaning of similarities. Reading Comprehension includes, (*E*) Following Direction, (*F*) Interpretation, (*G*) Organization.

Gates Primary Reading Test (47) was given the first grade pupils. The three tests in the battery are: Type 1, Word Recognition; Type 2, Sentence Reading; and Type 3, Paragraph Reading.

Although both the Progressive Achievement Test and Gates Primary Reading test can be used for diagnostic purposes within limits, a test especially constructed for diagnosing specific reading difficulties seemed desirable for this study. The test selected was Durrell's Analysis of Reading Difficulty (25). This is a test for Grades 1 through 6 that is administered individually. The areas of reading it purports to analyze are: oral reading, comprehension and recall; silent reading; flashed word recognition and analysis; and knowledge of letter names and sounds. Time and errors determine the scores for the oral and silent reading tests.

Exact ages of the children were taken from official school records. Information as to whether or not the families were on relief at the time, 1940-41, or had at any time for a two-year period prior to that date was obtained from the public welfare authorities.

The elementary school—white—involved in the study is in a small town of about 3,000 people, in a predominantly rural area of Southside Virginia. For the year 1940-41 the enrollment was approximately 300, first grade through the sixth.[15] A third of the children are transported by bus. Standardized tests are given annually, and for at least some ten years past the tests have showed the total attainment slightly above national norms. Economically, the area is poor, and the local health authorities place it low in nutritional habits.[16]

Only one child in the school was known to have impaired hearing. And there were no so-called non-readers although the school has its share of children with poor and very poor reading ability.

This description of the school population has been given to show that it is typical of thousands and thousands of school populations in every section of the country.

2. *Methodology*

A small room, approximately 9 feet by 5, on the second floor of the school building was reserved for the audiometer testing. The facings of its one door, transom and window were stripped with felt to protect it from as much outside noise as possible. The room was located at the end of a corridor where there was little passing. It was not near the main playground, and it was too far from the street to get traffic noises. Since the audiometer to be used was one designed for use in a reasonably quiet room rather than in a sound-proof one, it seemed in the main that the room was adequate for testing. Moreover, it is estimated that 95 per cent of the audiometers in use are used in quiet rather than sound-proof rooms (67, p. 17).

Deciding upon an optimum method for determining the threshold of audibility[17] was important. The audiometer is calibrated on the basis that the modal value of the threshold of audibility for a large number of normal adult ears represents the normal threshold of audibility or *0* (no loss) hearing; and that the amount of hearing loss at any given frequency is the ratio of the threshold of audibility for that ear to the normal threshold of audibility at the same frequency (2, p. 10).

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[15] The school has a kindergarten, but for obvious reasons the kindergarten children did not participate in the study.

[16] The school participated in the nation-wide nutrition survey in 1942 that was sponsored by the Children's Bureau, and the published results fail to place the school *lower* in nutrition than schools in the nation and state as a whole. However, the local health authorities consider the dietary habits of the population as a whole inadequate.

[17] "Threshold of audibility at any specified frequency is the minimum value of the sound pressure of a sinusoidal wave of that frequency which produces a pitch sensation . . ." (2, p. 9).

The American Medical Association's definition of the threshold of audibility is, "the audiometer reading corresponding to the lowest intensity at which the patient or subject can indicate correctly more than half the time" (66, p. 2).

A definition of the threshold of audibility does not help, except indirectly, in deciding what method to use in determining audibility thresholds for children. Certain methods that might be employed in a psychological laboratory for exploring the thresholds would be neither practical nor practicable for them. To help decide upon a method that could be used routinely with all the children several children were asked if they would be willing to submit to a rather long testing period. Ten of those volunteering were selected and the following procedure carried out with each: After the child was comfortably seated, showed how to hold the receiver, and told what was expected of him, the frequency dial was set at 128 and the intensity dial at the lowest[18] intensity,—10. The intensity was raised to the point at which the child indicated hearing, then lowered to the point at which he indicated not hearing. This was repeated 10 times. To interrupt the regularity of *hearing* and *not hearing,* the dial was occasionally turned much lower than the child was reporting not hearing, and turned at varying speeds for the same reason. After the 10 times ascending and descending, each intensity (steps of five decibels) in the range reported audible was tested by having the subject respond to 10 "offs" and "ons" as the interrupter was used. This was repeated for the remaining tones, and both ears. Only one ear was tested at a sitting.[19]

It is certainly understood that physical and psychological changes taking place from day to day may make tests at two sittings less valid than a complete test at one sitting. Dr. Gardner observes empirically (as he says) that he gets worse results on cloudy days than on sunny days.[20] However, changes are constantly taking place even during one sitting, and since this exploratory testing took some time the element of fatigue was controlled to some extent by two sittings.

The results obtained from this preliminary testing showed that the range of intensities between *hear* and *don't hear* was not wide (probably due to the fact that the intensity is set in steps of five decibels) and that the lowest intensity that the child could make five correct of six responses would identify satisfactorily the momentary stimulus threshold for each of the 10 frequencies. Briefly, the technique selected for establishing the momentary threshold of audibility for each of the 10 tones was: first, three rapid ascents and descents of the intensity dial to establish the range of intensities between *hear and don't hear;* then taking the lowest intensity reported heard as the point from which to work up or down the intensity scale to establish the lowest intensity that the child could identify correctly five of six times as "off" or "on." This method was uniformly observed with one exception: no effort was made to establish above normal hearing. When the range the child reported hearing extended below the *0* level, that is, was keener than normal, the testing ended with the *0* (normal) level.[21]

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[18] Ten decibels lower in intensity than *0* or normal level.

[19] A recorder kept careful records of the responses.

[20] *In correspondence.*

When the child came to the room for his test he was told to choose a chair that was comfortable. He was seated where he could not see the front panel of the audiometer and in such a position that he faced the tester. Then the purpose of the test was explained to him—that we wanted to find out the least amount of sound that he could hear. He was shown how to hold the receiver and cautioned to hold it firmly but lightly over his ear. If he seemed to have any doubt as to the position of the receiver it was placed for him. This was almost always done for the young children. The test began with either ear the child chose. The intensity dial was then set at 20 decibels and frequency dial turned to each of the 10 tones beginning with the 128 and on through the 11,584. If the child indicated not hearing any of the tones at this intensity it was turned to the level he could hear. He was told that those were the sounds he must listen for, but on the test they would be very faint and he must listen carefully; also that he must indicate the moment he heard a tone come on, and indicate the moment it faded out. He was asked to signal by the slightest nod of the head.[22]

The test proper began with tone 128, the lowest in the range, and proceeded sequentially through the 11,584. Before turning from 4,096 to the 5,792 tone the child was told that having the opening in the receiver directly opposite the ear canal was particularly important for the remaining three tones, and that he must hold the receiver lightly, not pressing it against his ear. If he did not hear these high tones at or near the zero level the receiver was adjusted for him; after the adjustment if he still did not hear it was suggested to him that he change the receiver himself to see if he could hear with it placed in some other position. If he did not hear, the intensity was turned to a point he could hear and he was asked to change the receiver to the position he could hear the sound the best. The threshold was then determined.

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[21] Both Miss Ena Macnutt and Dr. Warren H. Gardner in correspondence relative to testing children's hearing suggested not testing below the *0* level for reasons that their years of experience and study had established. Miss Macnutt is the Supervisor of hearing tests of the Division of Research and Guidance in the Newton, Mass., Schools. Dr. Gardner is the Chairman of the Committee on Hard-of-Hearing Children of the American Society for the Hard-of-Hearing.

[22] The suggestion for an indication of this sort rather than by using the push button was also made by both Miss Macnutt and Dr. Gardner.

This extreme care for testing at the high tones seemed necessary because the position of the receiver and manner in which it is held affect the test results for high tones to an extent that is not the case with the low tones. The low tones spread. The high tones are sharp and directional and the limen may be considerably raised unless the ear canal is in the direct path of the sound waves, or if the receiver is pressed too tightly against the ear. On the other hand the ear becomes overloaded more quickly by high tones than low and care was taken that testing for high tone frequency levels was not unduly prolonged.

The procedure described was followed for both ears and again for re-tests.

Children differ in the lengths of time they can concentrate without fatigue or boredom. Short rest periods were taken when signs of either appeared in the child's facial expression or his manner. Two sittings were deemed advisable in some instances. The youngest children were tested in two sittings rather than one. Furthermore, it takes a longer time to establish the thresholds of audibility for a child who has a great deal of hearing loss because he is less certain and therefore less prompt in his responses than the normal hearer, so in several cases two sittings seemed necessary.

Care was taken at all times that the child was comfortably seated with a table of correct height on which to rest his arm. He was seated not to face the glare from the window. And—important—his playtime was not taken for testing.

The re-test was given approximately two weeks after the first one without reference to the results of the first.

When tests and re-tests had been made for 50 children the data were statistically analyzed to determine, primarily, whether at times a third test was indicated. Specifically, the questions to be answered within the limits of the data were:

1. How much variation on the test and re-test is normal? Variations beyond what limits would make a further test desirable?

2. Is the amount of variation to be expected uniform for all frequencies?

3. When a first test shows hearing at *0* or close to *0* level is a re-test desirable?

4. Does the practice effect result in a better hearing score on the second ear tested at a sitting, and a better score on the re-test than on the first test?

Analysis of the data showed that:

1. The variability (sigma) for changes on the re-test was 5.80 for the two ears combined; 5.96 for the left ear and 5.61 for the right ear. Considering these changes normal or due to chance and the 3-sigma units as the upper limit for accepting changes as meaningless, a shift in threshold of 20 decibels or more at any frequency would indicate that a third test should be given for that frequency.
2. The variation was practically constant for all frequencies. The slight differences did not seem to warrant a differential procedure.
3. Zero scores, either test, were not different in variability from other scores. The 3-sigma limit of chance variation would make the range 0-5-10-15 equivalent to zero.
4. Means for the second ear tested indicated slightly less acuity than those for the first ear tested; and the retest slightly less than the first test. The increased deficiency suggested that fatigue or boredom or both were a greater danger than practice.

This bit of analysis seemed important for the prosecution of the specific study under way and possibly for other investigations of children's hearing. The amount of variation to be expected under the particular testing conditions gave a definite criterion for a third test. The same variability might not be normal with a different instrument, a different age group or different testing techniques, however. The fact that a hearing score of *0* varied just as much as a hearing score of 50 argues that if there is justification for retesting the poorest hearers there is justification for retesting the best hearers—a practice that is not generally followed. And it is certainly suggestive, inferentially, as to the dangers of specifying the amount of hearing loss at any frequency unless the measure is understood to express a momentary value only.

The testing program continued—test, retest, and a third test for frequencies where test and retest scores disagreed as much or more than 20 decibels. When there was a third test, the two scores nearest in agreement were recorded as the test and retest scores.

Little need be said as to the methodology of the external otological examinations. The doctor had reference to at least one of the hearing tests when she made the examination. It would doubtless have been desirable to have the otological follow a hearing test immediately, but having them within a few weeks of each other was the best that could be done.

This difference in time may be of importance in interpreting the results. The classification of defects was made with the purposes of the study in mind. Other classifications might have served.

The reading tests used for assigning attainment were mentioned earlier in the chapter; however, some further information seems pertinent at this point. The raw scores on the Progressive Achievement Tests can be read conveniently from the manual in corresponding grade placement and achievement age. This can be done for the total reading score, or for any of the subdivisions. For this particular study the age in months corresponding to the raw scores for total comprehension, total vocabulary, and the two combined were used as the basis for expressing attainment. However, achievement age was hardly adequate. Achievement age is significant only in relation to chronological age. An achievement age of 100 months does not convey the same implications regarding the attainment of a child who is chronologically 85 months old as it does for a child who is chronologically 150 months, or for a child who is 100 months in actual age. A medium for expressing attainment comparable for all age groups was needed. A "reading quotient," the ratio between the child's actual age and his reading attainment age, expresses a relationship between the two ages and was adopted for this study. Thus, a comprehension score (raw) of 11 is equivalent to 94 months in achievement. A child 10 years old making a score of 11 would have an *RQ* (reading quotient) of 94/120, or 78; a child 7 years and 10 months old making the same score would have *RQ* of 94/94, or 100; or a child 6 years and 9 months old with the same attainment would have an *RQ* of 94/81, or 116. Reading quotients were computed for Reading Comprehension and Reading Vocabulary separately and combined. The Gates Primary Reading Tests Manual also gives a reading age in terms of months, so the same procedure was followed for computing Reading Quotient for the first grade children.

It was recognized that Reading Quotient was not an entirely satisfactory means for expressing reading attainment. Vagaries are inherent however in quantitative and qualitative measure of achievement regardless of how the values are expressed; and in spite of the limitations of Reading Quotient it appeared to be the one best means at hand for arriving at one value comparable for all age groups.

Children whose *RQ* was below 100 on either the Comprehension or Vocabulary test, or on the Gates test were given Durrell's Diagnostic Reading Test. These children were taken individually to some room not in use at the time. Directions as given in the Manual were carefully followed. A stop watch was used for recording time for the sections of the test requiring that time be noted. The child is not stopped at a given time limit but the time required to complete certain tests enters into the final scoring along with the errors made. Two sittings were necessary for most of the poorest readers.

Questions arose as to the scoring of the tests because the examiner was not sure she fully understood certain scoring directions given in the manual and Dr. Durrell's help was requested. He graciously agreed to answer the questions and to score a half dozen of the tests to serve as models.

As is readily apparent, a great deal of information was collected for this study. Adequate analysis and interpretation of the data demanded that the mechanics of sorting and classifying the many variables be accomplished with a minimum of errors. The routine handling of many of the data was done by means of the punched card method (3). This method involves the coding of the several items of data into as many step intervals as the particular machine to be used is designed for—in this case, 10. The code numbers are then punched into tabulating cards by means of an electric punching machine. The punching machine used has one key each for the 10 punching positions of a column. As a key is depressed a perforation is made and the card is automatically moved to the next column. The cards have 80 columns, thus values for 80 variables can be punched into the card. An electric sorting machine sorts the cards into a desired sequence or groups them according to some information punched in them. As the cards pass through the machine a brush contact is made through the perforation which causes an electric current to be closed and the card to be directed to a receiving pocket. The receiving pockets correspond to the perforation positions—0 through 9—and carry tabulation counts for each. This automatic sort is made on one column at a time. For example, it sorts boys into age groups after boys and girls have been sorted; or it sorts the scores on the 128 frequency into 0, 1, 2, 3—9 loss after the various frequencies have been sorted. A third machine compiles the data into printed reports. This machine is a combined adding, subtracting, and printing machine. If, for example, one wants a correlation between age and hearing loss at a certain frequency the electric controls can be set to print a scattergram of the information.

Scattergrams for the correlations between test and retest at each frequency, left ear and right ear loss at each frequency, and the intercorrelations of tone loss for each frequency for left and right ears were obtained by the punched card method just described; also, for the correlations between *RQ* and low, middle, and high tone loss; the sorting to obtain mean hearing losses for the total population, at low, middle, and high frequencies; the mean loss at low, middle, and high frequencies in relation to otological defects and economic status.

For certain types of analysis smaller step intervals than allowed with the cards seemed advisable. Tabulations for these were done by hand, as was the case for determining mean hearing loss at each frequency, mean hearing loss at low, middle, and high frequencies for children within various *RQ* ranges, otological information for children within certain hearing loss ranges, and mean hearing loss for children at certain age levels. In addition, all of the diagnostic test results were handled by hand as they did not conform readily to coding and mechanical manipulation.

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SHORT ARTICLES AND NOTES

The Journal of Genetic Psychology, 1947, **70**, 233-235.

THE RELATION BETWEEN INTELLIGENCE AND CARDIOVASCULAR ACTIVITY BEFORE AND AFTER VISUO-MOTOR CONFLICT*

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A. PURPOSE

The purpose of this experiment was to determine the effects of intelligence upon the cardiovascular responses immediately before and after the induction of visuo-motor conflict. In a previous paper (1) Brower has presented the correlations between time and error scores on the Snoddy (3) mirror-drawing apparatus and respiratory and blood pressure indicators. In another study Brower (2) has treated the blood pressure and pulse rate indicators in greater detail. In this latter study the relations between intelligence quotient and time and error scores of the Snoddy task were found to be inverse when a group of college undergraduates was employed. The question posed in this paper is to determine the correlations between intelligence quotient and the cardiovascular indicators themselves.

B. METHOD

Forty-eight undergraduate students at New York University were given the Snoddy mirror-drawing task under the conditions of direct vision, mirror vision, and the blindfolded state, in that sequence. Before and after the experiment the blood pressure and pulse rate were determined. The intelligence quotient was determined through the use of the Wechsler-Bellevue Adult Intelligence scale (4). The details of method are discussed in a previous publication (2).

C. RESULTS

Tetrachoric correlations were computed between intelligence quotient and each of the following both pre-experimentally and post-experimentally: diastolic blood pressure, pulse pressure, and pulse rate. Systolic blood pressure

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was excluded because of its composite character. The pre-experimental correlation for diastolic pressure was —.43; for post-experimental diastolic pressure —.22. The pre-experimental correlation for pulse pressure was —.50; —.66 for the post-experimental correlation. The pre-experimental correlation for pulse rate was —.60; the post-experimental correlation was .15. Whereas the coefficients of correlation for post-experimental pulse rate and the post-experimental diastolic pressure were not statistically significant, all other coefficients were significant.

D. Discussion

The relationships between intelligence and all of the cardiovascular measures in the pre-experimental state are consistently inverse. This would indicate that higher intelligence tends to accompany lower pulse rate and blood pressure readings prior to an experiment of this kind. It must be emphasized that the pre-experimental condition is not a true basal state, i.e., the so-called pre-experimental readings were taken after the subject was reassured as to the harmlessness of the experiment, he was permitted to rest for five or more minutes, and observed all of the apparatus in the laboratory. Furthermore, for many hypersensitive or hypochondriacal subjects, the mere process of recording the activity of the cardiovascular system is sufficient to alter the readings from what they may very well be under truly normal conditions. Nevertheless, within a relatively skewed group, such as a college group, in which the range of *IQ* was 100-130, the students who scored highest for intelligence scored lower for cardiovascular activity. This general trend was apparently maintained in the post-experimental condition for pulse pressure, the other two post-experimental coefficients having been found to be statistically insignificant. It may very well be that the disorientive character of the visuo-motor experimental task constitutes an influence which far outweighs the limiting value which superior intelligence exerts upon cardiovascular activity prior and/or after the Snoddy task.

E. Conclusion

Further evidence is offered for the hypothesis that general intelligence as measured through the use of a standard intelligence test battery, constitutes a limiting value upon behavior under experimentally induced visuomotor conflict, as manifested through the cardiovascular sector of the autonomic nervous system. The most superior individuals, from an intellectual point of view, tend to be able to operate in an experimental situation, such as used herein, without generating the cardiovascular excitation that persons nearer the average for intelligence would tend to exhibit. However, *after* the stress experiment, only the pulse pressure maintained a mutually exclusive correlative trend with general intelligence. Further study would be needed to elaborate the reasons for these findings. Perhaps the most highly intelligent, out of a group of college students, are most strongly inhibited and repressed with regard to peripheral motor discharge under stress. Otherwise, the inference might be warranted that general intelligence, or the *G*-factor, functions also as an aid in overcoming the effects of experimental frustration, either directly or in a compensatory way.

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BOOKS

The *Journal of Genetic Psychology*, the *Journal of General Psychology*, and the *Journal of Social Psychology*, will buy competent reviews at not less than $2 per printed page and not more than $3 per printed page, but not more than $15.00 for a single review.

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MURPHY, G., *Ed.* Human Nature and Enduring Peace. New York: Houghton Mifflin, 1945. Pp. 475.

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CRITICAL REVIEWS OF RECENT BOOKS

The Journal of Genetic Psychology, 1947, 70, 239-248.

(Hunt, J. McV., Ed. Personality and the Behavior Disorders. New York: Ronald Press, 1944. Pp. 1242.)

Reviewed by W. Drayton Lewis

Personality and its aberrations constitute one of the most challenging fields of psychological inquiry today and any well conceived and well executed work in the field is welcome. The two volumes of *Personality and the Behavior Disorders* are a valuable addition to the literature on personality, and will, without doubt, be widely used. It is not the purpose of this review to present a detailed analysis and criticism of the two volumes. The contributions are too numerous and too comprehensive to make such a presentation feasible. Many, no doubt, will find much to criticise in the contents of the compilation but it seems more pertinent to discuss the structure and content of the two volumes in order that those who are seeking useful material may be able to determine whether or not the contents will meet their needs.

The two volumes are the work of 40 authors and were ably edited by Dr. J. McV. Hunt. Those who have read similar compilations know what to expect. A unitary point of view, a completely logical presentation and uniformity of writing are not to be found, or to be expected. It is not intended to be an introductory textbook on personality and certainly could not be used successfully as such with immature students. The two volumes might be useful as a textbook for mature students who were well prepared for a comprehensive investigation of personality. It is probably true that few, if any, instructors would desire, or even be able, to include in any one course all the material that is contained in the two volumes. The instructor who uses these two volumes as a textbook will find it necessary to do a great deal of selection and elimination in order to avoid swamping the students. The volumes, however, were not intended primarily as a textbook and will find no large field of usefulness as such but will be an essential addition to the reading list in many courses.

The basic assumption of the editor was that the study of personality and its development must of necessity draw heavily from all the life sciences and, accordingly, the 40 contributors to the two volumes represent quite varied fields of activity. Many, of course, are professional psychologists. The field of medicine is well represented, and many clinicians contributed. The fields of sociology, anthropology, psychiatry, child guidance, and mental hygiene are also represented. The broad selection of contributors enhances the value of the two volumes since it makes available to the reader not only a wide range of highly specialized knowledge but also many viewpoints and approaches to the problems of personality.

It is obvious that no one or even two or three investigators would have the breadth of experience, or knowledge, to write two volumes which cover such broad areas of investigation. Many students feel that a presentation which is the work of so many contributors must inevitably have weaknesses such as lack of consistency of viewpoint and uniformity of presentation. But it is also true that books which cover such broad fields of investigation and written by one or two authors also have weaknesses. It is seldom possible in volumes covering such broad fields of investigation to avoid weaknesses of one kind or the other. Most instructors will probably solve the problem by using two types of presentations, one which embodies a single viewpoint and material such as we are considering here. That which makes for weakness here is nevertheless also its strength—each chapter is written by an investigator or practitioner who is thoroughly familiar with the methods, achievements and needs of his field.

Few volumes have succeeded so well in holding theory and technical jargon to a minimum. This will disappoint many, no doubt, particularly those whose primary interest is in theory and who believe it to be of prime importance. Most readers, I believe, are not primarily interested in theory and are only confused by unnecessary usage of technical jargon. So many technical writer's today use a "private language" which fails to convey meaning to the reader, or often conveys the wrong meaning. These volumes do not err greatly in this direction. The language is, at times, necessarily technical. Terms, however, are carefully defined whenever possible and every reasonable effort is made to keep the reader informed as to how terms are used. This makes these volumes quite superior to many contributions in the field of personality. I can think of few contributions in the field of personality that have succeeded so well in this regard.

These statements are not meant to imply that the material is given a "popular" type of presentation or that the two volumes constitute easy reading. They do not. The presentation is scholarly and is intended for the use of serious investigators. It is a sound, solid presentation of theory, methods of investigations and findings in the field of personality and its disorders. I do not believe that there are many students of personality who are so well informed that they will not profit from a careful study of at least some of the material presented in these volumes. This type of presentation fulfills an essential need, I believe, since it is manifestly impossible at the present time for any one individual to be well orientated in all fields of personality investigation. Some assistance from well-executed compilations of this kind is necessary if a student of personality is to be generally well-informed as to the various aspects of personality investigation.

The major emphasis in the first volume is on "Personality" whereas the emphasis in the second volume in upon "Behavior Disorders," except for the first section which is concerned with the developmental approach to personality. Both the cross-sectional and longitudinal approaches to the problems of personality are given adequate consideration. The editor of these volumes has endeavored to give adequate consideration to all types of approaches to the problems of personality, to all methods of investigation, and to the wide variety of personality problems which are being studied by contemporary students, clinicians, and investigators.

Some chapters are, of course, much more comprehensive and richer in content than others but the reader must recognize that some aspects of the problems of personality have been much more thoroughly investigated because they have been much more pressing or because they are more easily studied. Readers must also remember that some concepts are relatively new, for example, levels of aspiration, frustration and conflict theories. Chapters dealing with these investigations must be read in that light. It is easy to criticize such approaches to personality, at the present time, as not being integrated to general theories of personality. These investigations are, as yet, in what research men like to call the "exploratory" stages which means that no one is quite certain what fruits their methods will bear, how they are related to other investigations of personality or what will be their final contributions to an understanding of personality.

The general pattern which is followed by most of the contributors in the organization of their material is to carefully define terms and concepts, sketch the historical development of the concepts, discuss the the varied approaches which have been made to the problem, to give as thorough coverage of research as space permits and to evaluate findings in the field, suggesting profitable future approaches to the problems.

One of the most valuable features of the work for many readers of the volumes will be the excellent and extensive bibliographies which are to be found at the end of each chapter. Two volumes make available valuable supplementary material for courses in personality, clinical and abnormal psychology and related courses. I have already found the volumes to be very useful in graduate courses and am quite certain that many teachers will find them to be useful with mature and able undergraduates as well as with graduate students.

The presentation of personality in these volumes will be most disappointing to those whose primary interest is theoretical and who are wholly committed to some one system. Many will, no doubt, apply the term eclectic to the approach of these two volumes but, for many of us, that is not necessarily a term of disapprobation. The editors and contributors should be commended for minimizing schema and theory. This does not mean that theory is ignored in these volumes. It is not permitted to dominate. The primary effort is to define terms, present the history of the concept, and to summarize investigations. The clinical approach is emphasized and the contributors never depart far from the main theme, which is personality and its disorders. The reader who masters the two volumes will have a fairly complete picture of what we know and do not know about personality, methods of measurement, and problems which are in need of additional research. The reader will not be well informed as to theoretical approaches to personality.

Part I is concerned with "Theoretical Approaches to Personality." The first chapter deals with such basic approaches to a study of personality as the history and definition of the concept and of related concept theories of the structure, types, factors, and traits of personality. The writer, D. W. MacKinnon, takes the position that an adequate theory of personality must recognize both the specificity and generality of behavior and also personal consistency and inconsistency. Radical anti-trait theory, which denies any generality to behavior, is held to commit the "situation error" in assuming that all behavior is determined solely by specific situations in which the individual finds himself, whereas the advocates of extreme trait theories are held to commit the "organismic error" in thinking of all traits as fixed attributes of an organism. MacKinnon holds that a field theory of personality which sees "behavior and personality as functions of a total field of which they are subparts, is the form of theory which today seems best suited for the conceptual representation of personality."

> On the psychological side this theory will take account of both mask and substance aspects of personality, fully recognizing that much that looks like specificity of behavior, and is specificity if viewed from the standpoint of action *qua* action, is actually an expression of gen-

> erality and consistency if the setting of the behavior and its meaning for the total personality is considered. On the logical and mathematical side this theory will recognize that the traits or factors of personality range from the most specific to the most general and that the differences between specificity and generality is formal rather than material, relative rather than fixed (43).

This first part includes two typical but divergent views as to the nature of personality as examples of contemporary thinking. Dr. Edwin R. Guthrie, an outstanding exponent of associative learning theories, writing on "Personality in Terms of Associative Learning," represents the atomistic, empirical approach to the concept. The emphasis is descriptive rather than normative. Personality is defined in terms of "habit-adjustment" and is held to be founded on "learned adjustment." Associative learning and habit formation are fundamental in this approach which contends that personality "must" be described in terms of learned skills and adjustments rather than of general traits such as "introversion" and "extroversion" and the like. The basic concept here is habit—habit-movements and habit-acts—and personality is defined as "those habits and habit systems of social importance that are stable and resistant to change." Trait specificity is emphasized, with general features of behavior the product of repeated exposure to recurring general features of situations and the search for universal traits is held to be a futile quest. This view emphasizes personality as a practical concept and the practical meaning of a personality trait is held to be "potential behavior."

O. H. Mowrer and Clyde Kluckhorn present a "Dynamic Theory of Personality." The phrase, "Dynamic Theory of Personality" is taken to mean a composite of postulates and concepts drawn from psychoanalysis, social anthropology, and the psychology of learning. The basic concepts in this presentation of personality are functionalism, conflict or ambivalence, field or context, and integration or internal consistency. These propositions are held to be the "minimum essentials of a dynamic theory of personality." Personality, as defined in this chapter, "refers to the individual as an organized, adjusting, behaving entity, not to the way in which this individual may influence other individuals or things" (77). The emphasis, then, is not upon personality as a social concept. This view recognizes that the individual must have a "social stimulus value" before "personality" can become an object of scientific study but it is denied that the individual's personality is this "social stimulus value." Personality, in this view, is primarily an "organized, integrated pattern" of "relatively stable, predictable habits."

A dynamic theory, it is held, must place the central emphasis upon a psychology of learning whose unifying principle is "the proposition that all behavior is *motivated* and that all learning involves *rewards*" (79). The authors hold that the major part of this chapter is "merely an extended commentary on 'the individual in society': i.e., the conception of 'personality' as a resultant of the fact that every individual has motives (both bioogically given and determined by learning) but must so pattern his adjustments as to make them conform to the expectations and limitations of other individuals" (86).

Personality emerges as a result of social interaction. Much space is given to a discussion of the socialization process as it shapes the individual during the period of infancy and childhood. Socialization, it is pointed out, is an active dynamic process which does not occur spontaneously. It has to be "arduously accomplished by the endeavor of parents, teachers, and other surrogates of culture" (102).

The reader's reaction to this first section will depend very largely upon his interests in theory, especially in systematic theories of personality. It is a necessary section but it is probably true that it will have less appeal to the average readers than some other sections. There is probably less interest in theories of personality than in any other phase of the subject and the reaction to this section will probably be determined more by individual bias and interests than will the reactions to the remaining sections.

Part II deals with "Cross Sectional Methods of Assessing Personality" and is composed of three chapters which discuss the various methods of evaluating personality that are in current usage. Edward S. Jones, in "Subjective Evaluations of Personality," discusses such methods of evaluation as letter of recommendation and application forms, interviewing, ratings, and case study methods. The view is expressed that the appraisal of certain aspects of personality is, and probably must necessarily remain, a personal and subjective estimate based on vague cues. This means that artistry must always play a part in such evaluations.

Dr. Jones emphasizes that a major dilemma is involved in the attempts to obtain a subjective evaluation of personality. Accuracy and reliability of measurement are, of course, the goal and this demands objectivity. Too much emphasis on objectivity, on the other hand, may cause one to lose sight of appraisals which are ultimately subjective and which, if ignored, may make impossible a complete evaluation of the individual. The writer acknowledges that objectivity is the goal of personality measurement but wisely points out that in our present stage of knowledge, it is still necessary to turn to subjective measures of evaluation which, if wisely used, produce "self-validating criteria." The chief problem of personality measurement, then, is "to attempt a synthesis of both kinds of emphasis, to be reliably accurate and also convincingly complete, is the primary burden of the modern student of personality diagnosis" (141).

The summary, given at the close of the discussion of recommendations and letters of application, might well be a conclusion to the whole question of the subjective evaluation of personality as presented here.

> One school wishes to emphasize specific items for the purpose of reliability, the other prefers a more natural, free expression as more useful and valid. As previously suggested, one school implies scientific control, the other is more concerned with generalization based on many subjective impressions (144).

The ever present problems of subjective evaluation of personality are those of reliability and validity. The belief is expressed that these problems are in need of more thorough investigation. The important point also is made that it is a problem of using these forms of evaluation with common sense and of doing an intelligent job of administering them. The final emphasis stresses that: "The judge should always observe the individual in real situations; he should judge ability for a purpose; and he should be thoroughly motivated for careful reporting" (166).

J. B. Maller's discussion of "Personality Tests" is excellent and comprehensive. He gives a clear picture of what these measures will and will not do and of what uses legitimately can be made of these tests. His most significant statement is:

> In recent years there has been relatively little progress toward the improvement of personality tests and a noticeable scarcity of original approaches. In spite of the abundant productivity in this field, there is little evidence of originality of approach or of newer trends. The great number of reported studies were routine applications of ineffectual procedures (203).

Robert W. White has an adequate discussion of those methods of studying personality which have come to be known as "projective techniques," in a contribution entitled "Interpretation of Imaginative Productions." The historical development of these techniques, their validity and reliability are presented in an objective manner.

These discussions of the current methods of assessing personality are adequate and objective. The reader is given a clear picture of the present status of personality measurement and evaluation. The very pertinent questions of reliability and validity are handled effectively as are the problems and possibilities of the assessment of personality.

Part II bears the title "Behavior Dynamics, Experimental Behavior Disorders, and Hypnotism." The first three chapters are concerned with the psychoanalytic approach to personality. T. M. French takes the position that psychoanalysis is primarily a method of therapy—"the method is a clinical one and must always keep in mind the therapeutic interests of the patient" (206). Psychoanalysis as a scientific method is held to be based in a single, very simple principle—"If we do not understand a person's behavior, we seek to make it intelligible by finding its emotional context." Both the first and third chapters of the section hold that experimental psychology has not been a fruitful approach to the problems with which psychoanalysis is dealing. The second chapter is a discussion of the "Physiological Effects of Emotional Tension," by Leon T. Saul. The discussion is pertinent, comprehensive, and adequate.

The four succeeding chapters summarize laboratory findings relative to behavior disorders and deal with experimental studies of levels of aspiration, frustration theory, experimentally induced neurosis in animals, and conflict theory. These are relatively new approaches to problems of personality and the very newness of the approaches makes effective presentation difficult. Concise and clear statements of concepts and problems are almost impossible since approaches are still too new to have reached a level where it is possible to evaluate their contributions to our knowledge of personality.

The symbolic method of presentation, used in the discussion of "levels of aspiration," will prove unintelligible to many readers. The discussion of frustration is brief, as it should be, since little work has been done on the problem and the factors involved are not well understood. The work on experimental neurosis in animals is of interest to many but it must be recognized that many competent students of personality and its disorders seriously question whether such laboratory investigations throw any light on human neurosis.

It would be difficult to find a more satisfactory brief discussion of hypnotism than that contained in the final chapter of this section. The presentation is balanced and does not at any time oversell this phenomenon which so often has captured the fancy of the public. The viewpoint of the writer, Arthur Jenness, is best summarized in his opening paragraph:

> Hypnotism is literally a "tricky, cheating, or complicated" field of knowledge and research, even when one disregards the uses to which hypnosis has been put by exhibitionists and charlatans. Probably no psychological phenomenon has been the subject of so much investigation and is at the same time so little understood as hypnosis. Yet hypnotism still holds forth the promise of yielding a better understanding of human behavior; it engages the attention of many sober physicians and psychologists, much as it is deprecated by others (466).

Part IV, the final section of the first volume, deals with the "Determinants of Personality—Biological and Organic." The first two chapters on heredity and constitutional factors emphasize historical and methodological approaches to the problem. Any presentation of the problem of heredity which is compressed into the confines of such a few pages is certain to disappoint many. The writer was given an almost impossible task and could do no more than touch a few high points by way of indicating possible approaches to the problem and the difficulties of genetic investigations of personality. The chapter on "Constitutional Factors in Personality" is primarily an historical sketch. The other two chapters emphasize the physiological background of personality—brain lesions and psychological factors—and will prove of interest and value to many readers. The presentation is factual and objective.

Part V, the first in the second volume, bears the title "Determinants of Personality—Experimental and Sociological." Margaret A. Ribble's contribution, "Infantile Experience in Relation to Personality Development," is well-executed and I have found it to be one of the most helpful discussions of the important factors in this period that I have been able to make available to my pupils. The emphasis on Freudian contributions at the beginning of the chapter detracts from it for many readers and I have found it necessary to suggest in some cases that these pages be omitted. The three chapters which follow deal with childhoood and adolescent experiences in relation to personality development. They do not have a great deal to offer the reader who is already orientated in these periods. They are general in their approach and will be useful only to those who are unfamiliar with the fields of childhood and adolescent development. The final chapter of this section deals with "Ecological Factors in Human Behavior." The investigations reported here are concerned primarily with delinquency and mental disorders. This is a very important field of investigation at the present time and the material presented in this chapter should be familiar to anyone who desires to be well-informed on the subject of personality development.

Part VI, "Some Outstanding Patterns of Behavior Disorders," includes seven chapters and deals with some very important aspects of personality disorders. The treatment of the behavior disorders of childhood is excellent. The writer on delinquency and criminal personalities was obviously handicapped by the limitations of space and more adequate treatments of the problems are certainly available. It is unfortunate that the treatment of "Unfit Personalities in Military Service" does not contain any of the large amount of material that has come out of the late war so that, in a very important sense, the material is dated. Most of the bibliographical references are necessarily quite old since the chapter obviously was written before any of the newer material was published. Only three bibliographical references are later than 1931. The treatments of the neuroses and psychoses are adequate. Psychopathic personality is such a vague concept that a discussion of it is difficult, but the writer of the chapter on psychopathic personalities has handled a difficult problem in a way which should be helpful to those who want to know something of the problems involved. The unsatisfactory state of the concept is emphasized as well as the need for a clear description of the various problems of behavior. The chapter on "Seizure States" is quite adequate and well worth reading.

The chapter on "Psychological Deficit" differs from the ordinary treatment of the subject and introduces material which is not available to many readers. It is a distinct contribution to the material on personality. The second half of Part VII deals with "Electroencephalography." It is comprehensive and factual and will be of interest to many since this is a relatively new field of investigation which offers a very fruitful approach to some problems of personality. The coverage of the material is excellent and the bibliography quite complete.

The final section is concerned with therapy and prevention. The chapter on "Psychiatric Therapy" devotes a good deal of space to the historical background of psychiatry. It also takes up methods of psychiatric therapy; physiotherapy; psychobiology; psychoanalysis, its development; treatment of alcoholism, and therapy for children. The closing chapter deals with the prevention of disorders of personality. This section is highly suggestive and will be of value to those who are looking for good summaries of approaches to the problems of therapy and prevention.

These two volumes should be on the reading lists of all those who are interested in a study of personality and its aberrations. It is one of the best, if not the best volume of its kind. They cannot be recommended as a text for beginning students of personality and, when used with advanced students, it will be necessary in most instances to supply in some way the lack of consistent viewpoint which characterizes works of this type. The teacher who realizes the limitations of such a presentation will find it to be one of the most useful tools at hand for enabling students to become familiar with the wide variety of topics in the field of personality, inasmuch as it is almost impossible for students to investigate thoroughly on their own behalf, more than a few of these varied fields. Any mature student of personality will want to dip into some parts of the two volumes.

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BOOKS RECENTLY RECEIVED

(There will always be two pages of book titles, listed in the order of receipt, i.e., the most recently received books will be found at the end of the list.)

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